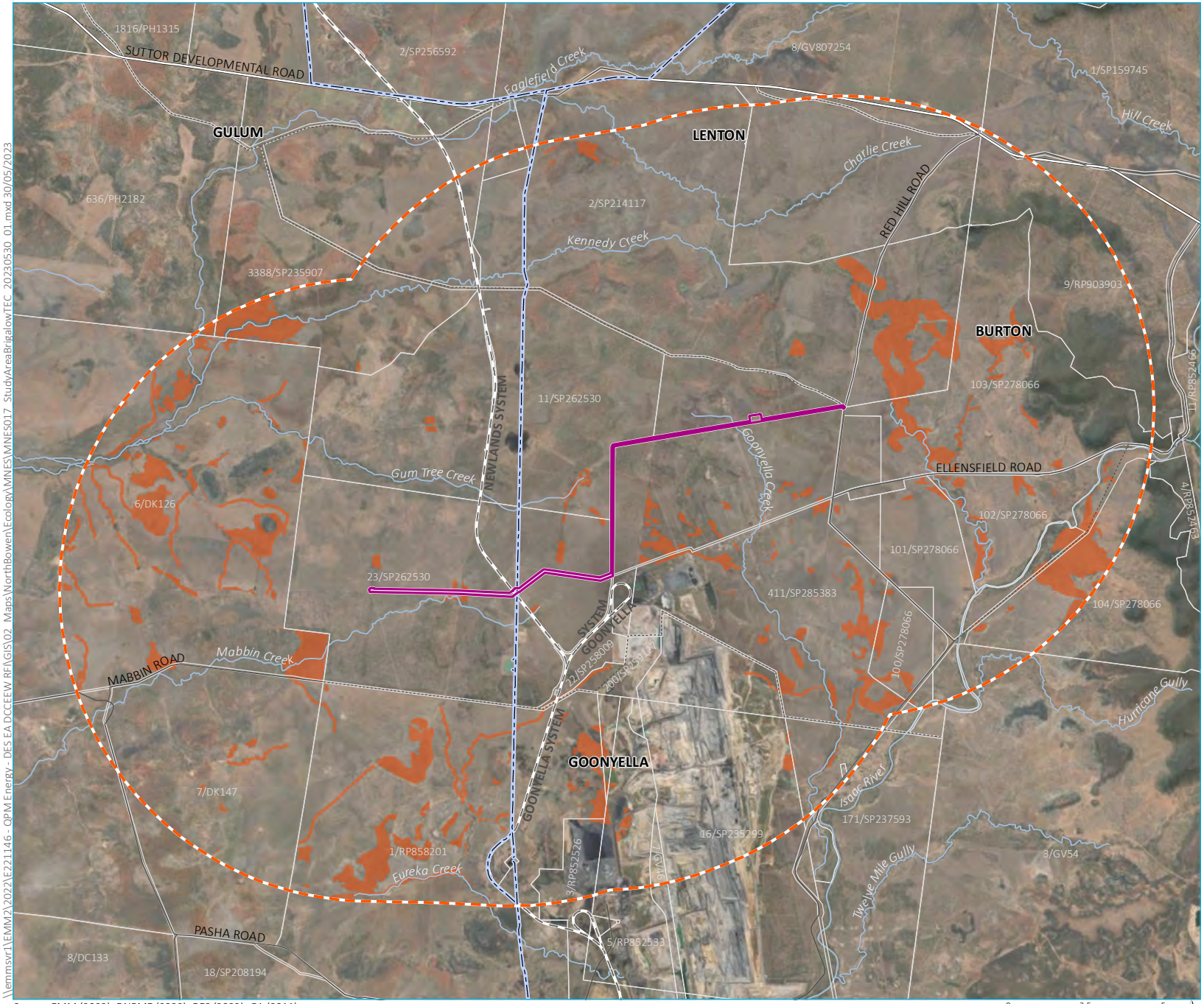


KEY

- Ecology study area
- Project area
- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary
- REs analogous with Brigalow TEC

Brigalow TEC potential habitat within broader study area

QPM Energy Project
MNES Preliminary Documentation
Figure 7.9

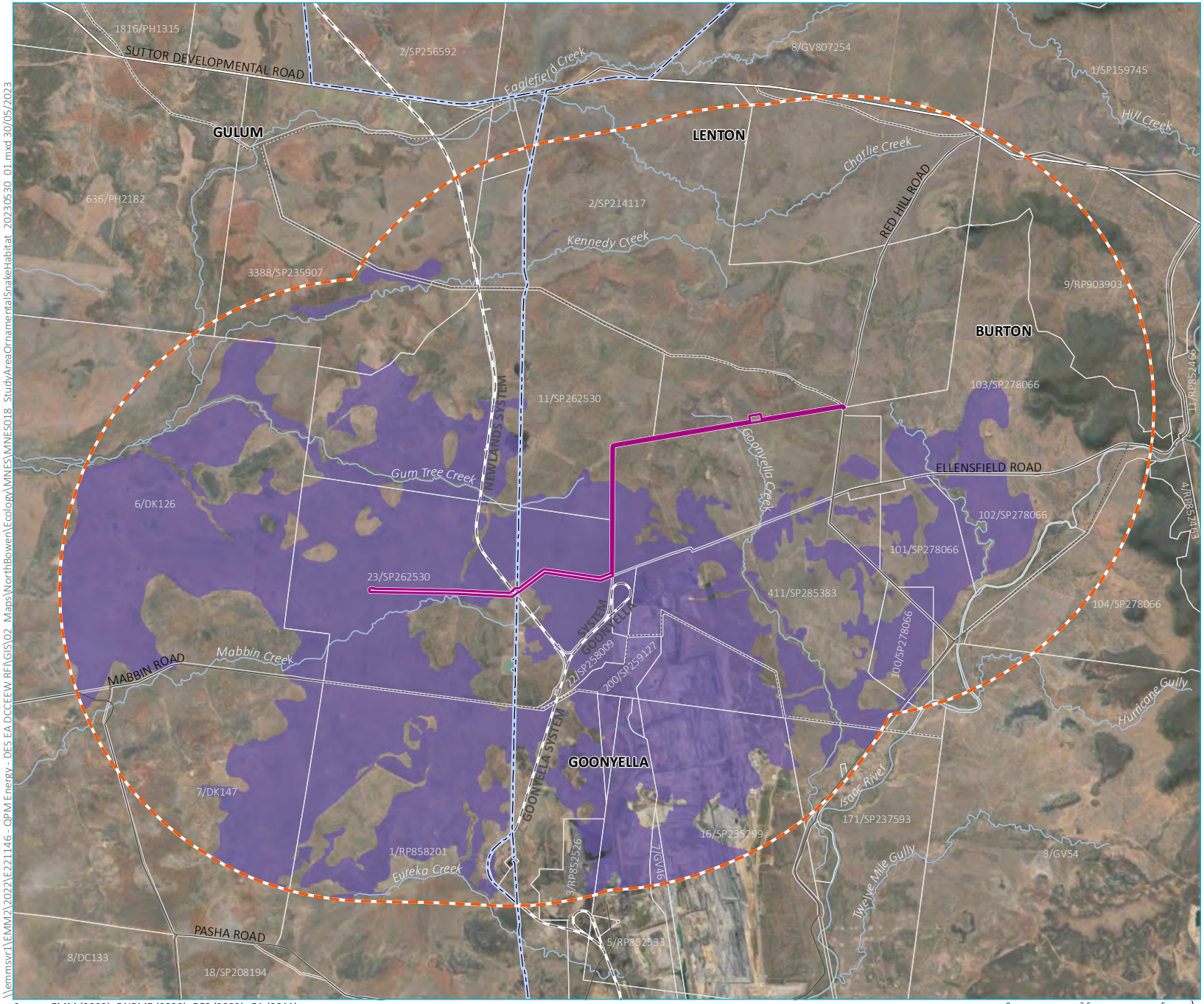
Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)

0 2.5 5 km
GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES017 StudyAreaBrigalowTEC 20230530 01.mxd 30/05/2023

EMM creating opportunities



KEY

- Ecology study area
- Project area
- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary
- Ornamental Snake potential habitat

Ornamental Snake potential habitat within broader study area

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Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)

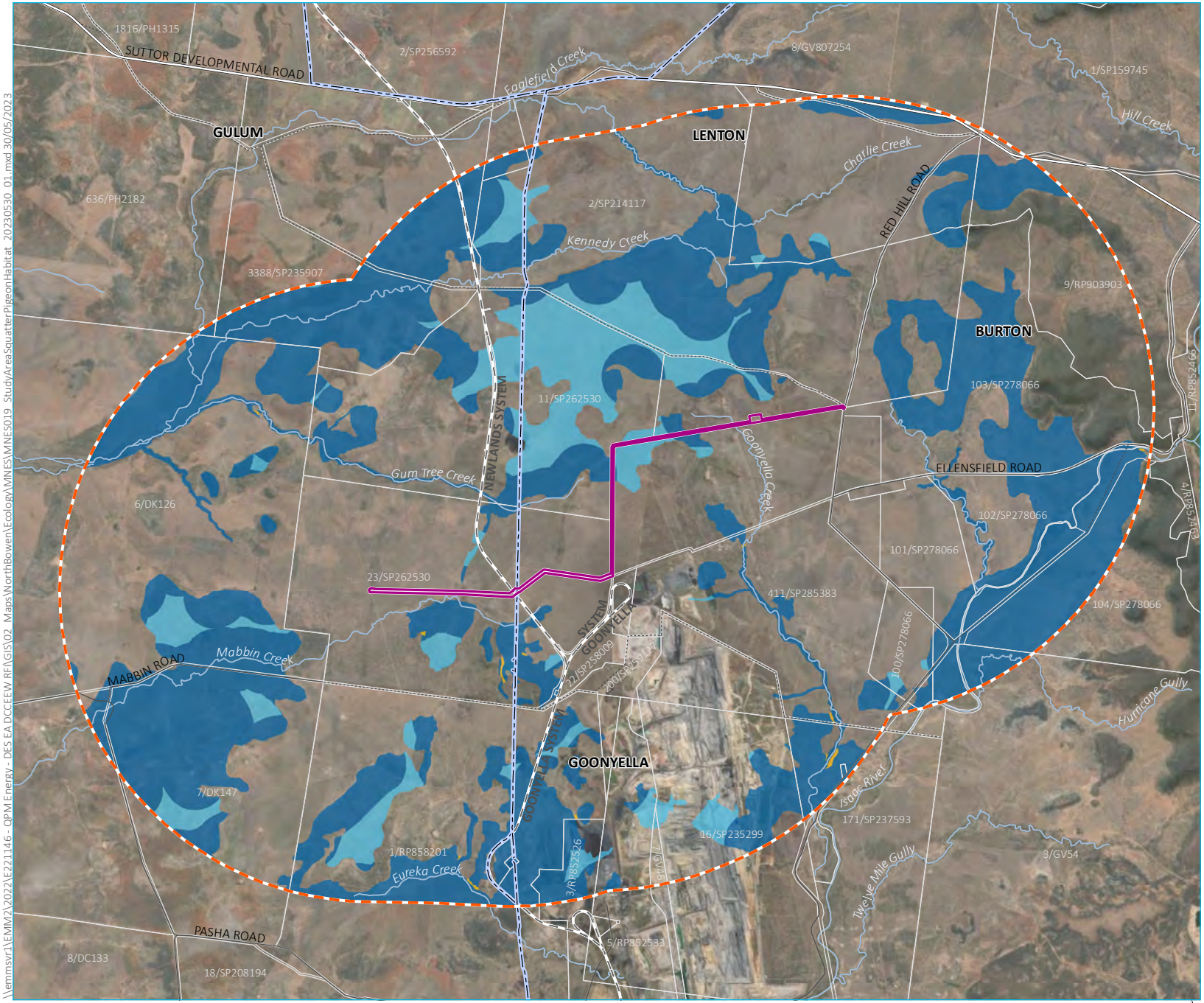
0 2.5 5 km

GDA 1994 MGA Zone 55

N

QPM Energy Project
MNES Preliminary Documentation
Figure 7.10

EMM creating opportunities



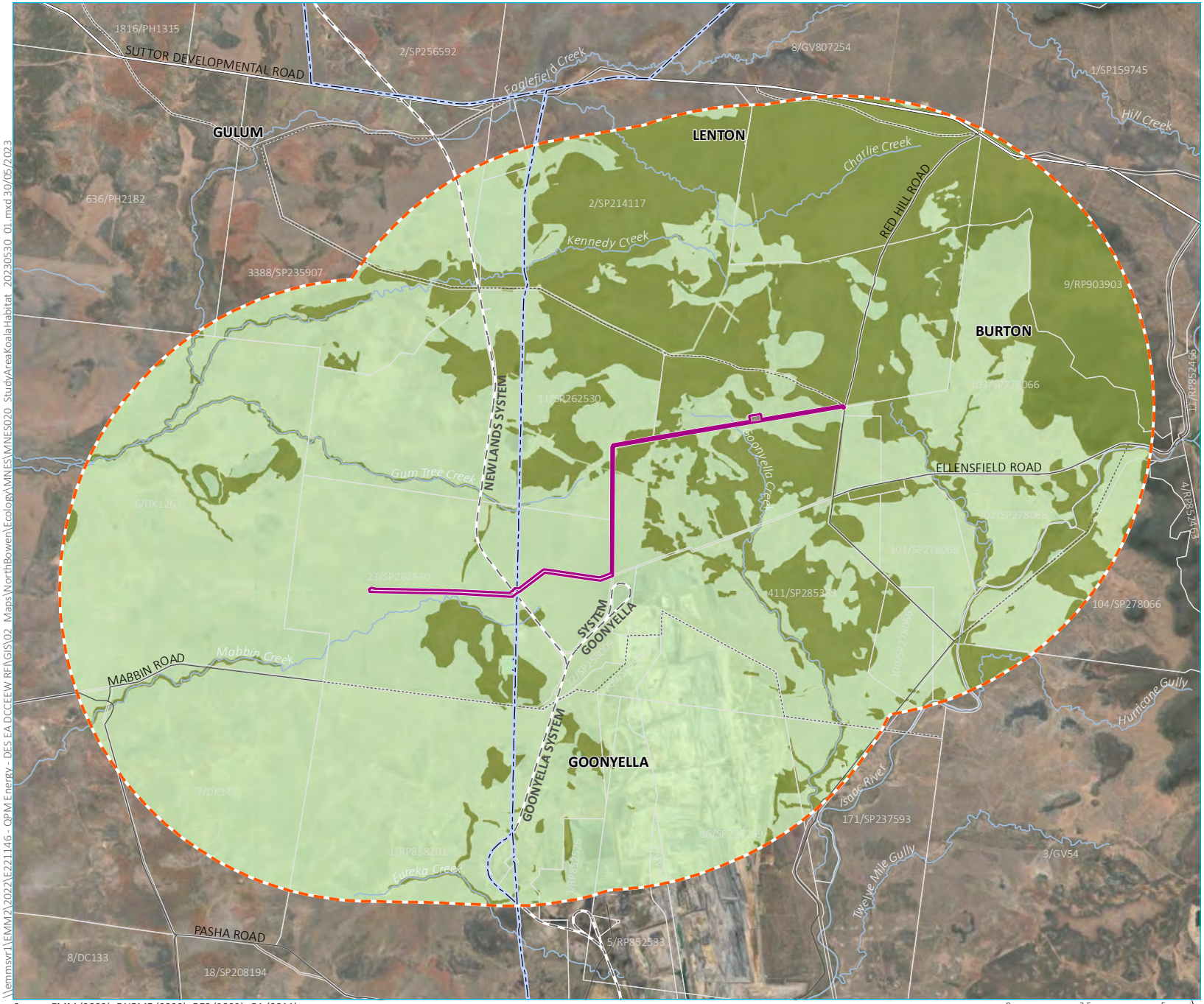
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES019 StudyAreaSquatterPigeonHabitat 20230530 01.mxd 30/05/2023

Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)

Squatter Pigeon potential habitat within broader study area

QPM Energy Project
MNES Preliminary Documentation
Figure 7.11

EMM creating opportunities


KEY
Ecology study area
Project area
Rail line
Major road
Minor road
Vehicular track
Named watercourse
Cadastral boundary
Koala habitat
Potential
Dispersal
GULUM
LENTON
BURTON
GOONYELLA
SUTTOR DEVELOPMENTAL ROAD
RED HILL ROAD
ELLENSFIELD ROAD
MABBIN ROAD
PASHA ROAD
NEWLANDS SYSTEM
GOONYELLA SYSTEM
Eaglefield Creek
Charlie Creek
Kennedy Creek
Gum Tree Creek
Goonyella Creek
Mabbin Creek
Eureka Creek
Isaac River
Hurricane Gully
Twelve Mile Gully
Hill Creek
1816/PH1315
2/SP256592
8/GV807254
1/SP159745
636/PH2182
2/SP214117
3388/SP235907
9/RP903903
11/SP262530
103/SP278066
11/RP852466
6/DK126
102/SP278066
4/RP852466
101/SP278066
23/SP262530
411/SP285233
104/SP278066
100/SP278066
7/DK147
171/SP237593
16/SP231299
1/RP858201
3/GV54
5/RP852533
8/DC133
18/SP208194
Koala potential habitat
within broader study area
QPM Energy Project
MNES Preliminary Documentation
Figure 7.12
0
2.5
5
km
GDA 1994 MGA Zone 55
N
Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)
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8 Impact assessment

Impact assessments have been undertaken in accordance with the Matters of National Environmental Significance – Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013a).

The methods provided within the guidelines are intended to determine the level of significant impacts on MNES due to the proposed action. This is achieved through 'significant impact criteria' which are imposed on identified values and vary according to the status of each value.

This section summarises the overall potential impact mechanisms on MNES as a result of the Project (including direct, indirect and facilitated impacts). Chapter 9 summarises impact management and mitigation measures to reduce impacts.

The MNES assessment results considering these impact mechanisms using the Significant Impact Guidelines (DoE 2013a) with full significant residual impact assessments, are provided in Chapter 10.

8.1 Conventions, recovery plans and threat abatement plans

International and national environmental conventions, recovery plans and threat abatement plans that Australia have obligations under and how the Project satisfies these obligations are discussed in the following sections.

8.1.1 International conventions

i Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) is the international legal instrument for "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" that has been ratified by 196 nations (CBD 2021).

Article 14 *Impact Assessment and Minimizing Adverse Impacts in the CBD* encourages projects requiring an environmental impact assessment that are likely to have significant adverse effects on biological diversity to adequately avoid or minimise these effects as far as practicably possible (CBD 2021).

This Project demonstrates that avoidance, mitigation and management measures to conserve biodiversity have been undertaken and are outlined in this section. Therefore, this Project is consistent with the CBD's obligations.

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

The main objective of the Convention on Conservation of Nature in the South Pacific (Apia Convention) is to commit the Parties to take action for the conservation, utilisation and development of the natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations (SPREP 2021).

The Apia Convention's objectives include creating protected areas, committing to not alter national parks, and listing and protecting threatened native flora and fauna (SPREP 2021).

All flora and fauna species recorded during ecology field surveys are listed in Appendix E. Comprehensive surveys have been completed to document native flora and fauna species, as well as threatened communities and species in the Project area. No protected areas will be impacted as a result of the Project. Therefore, this Project is consistent with the Apia Convention's obligations.

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

The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (CITES 2021).

MNES discussed in this report are not listed under CITES and no trade of these species will occur as a result of the Project.

iv Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)

The *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention) is an environmental treaty of the United Nations and provides a global platform for the conservation and sustainable use of migratory animals and their habitats (CMS 2020).

The Bonn Convention aims to take appropriate and necessary steps to conserve threatened migratory species and their habitat.

This Project provides proposed avoidance, mitigation and management measures against impacts to migratory species in Chapter 9. The Project has been assessed as having no significant residual impact to migratory species.

v Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

To ensure the conservation of migratory birds, the Australian Government has fostered international cooperation through a range of important agreements, including bilateral migratory bird agreements with Japan (JAMBA), China (CAMBA) and the Republic of Korea (ROKAMBA).

These agreements promote the co-operation in taking measures for the management and protection of migratory birds and birds in danger of extinction and also for the management and protection of their environments.

This Project provides proposed avoidance, mitigation and management measures against impacts to migratory species in Chapter 9. The Project has been assessed as having no significant residual impact to migratory species.

Therefore, this Project is consistent with the JAMBA, CAMBA and ROKAMBA's obligations.

8.1.2 National recovery plans and threat abatement plans

i Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads

The Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPC 2011) is a national strategy to guide efforts by all levels of government, research organisations and non-government organisations in reducing the impacts of cane toads on native animals and ecosystems.

ii Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses

The Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses (DSEWPC 2012) provides a framework for prioritising investment in threat abatement and identifies actions required to ensure the long-term survival of native species and ecological communities affected by the five grasses (Gamba Grass (*Andropogon gayanus*), Para Grass (*Urochloa mutica*), Olive Hymenachne (*Hymenachne amplexicaulis*), Mission Grass (*Cenchrus polystachios*) and Annual Mission Grass (*Cenchrus pedicellatus*)).

iii Threat abatement plan for predation by feral cats, Threat abatement plan for competition and land degradation by rabbits and Threat abatement plan for predation by European red fox

The Threat abatement plan for predation by feral cats (DoE 2015b), rabbits (DoE 2016) and European red fox (DEWHA 2008) establishes a national framework to guide and coordinate Australia's response to the impacts of these feral animals on biodiversity. They identify the research, management and other actions needed to ensure the long-term survival of native species and ecological communities affected by these feral animals.

This plan is relevant to management actions for Squatter Pigeon in the Project area.

8.2 Impact assessments

Impact assessments have been undertaken in accordance with the *Matters of National Environmental Significance – Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013) and EPBC Act referral guidelines for the vulnerable Koala (DoE 2014).

The methods provided within the guidelines are intended to determine the level of significant impacts on MNES due to the proposed action. This is achieved through 'significant impact criteria' which are imposed on identified values and vary according to the status of each value.

This section summarises the overall potential impact mechanisms on MNES as a result of the Project (including direct, indirect and facilitated impacts). Chapter 9 summarises impact management and mitigation measures to reduce impacts.

The MNES assessment results considering these impact mechanisms using the Significant Impact Guidelines (DoE 2013) with full significant residual impact assessments, are provided in Chapter 10.

8.3 Project footprint and disturbance areas

The Project disturbance footprint has been defined based on the Project Description in Chapter 4, to provide a maximum direct impact area. The Project footprint mapped and assessed within this report includes areas permanently required for infrastructure.

The total Project footprint is approximately 65.05 ha. QPM Energy will not clear any additional areas beyond those maximum disturbance limits identified. The GCF footprint is 6 ha. The buried pipeline reduces to an area of 30 ha which is predominantly existing farm tracks, firebreaks and pulled cleared pasture.

8.3.1 Avoidance and minimisation through Project design

During early stages of Project design, and following ecological surveys of the Project area, QPM Energy has sought to avoid and minimise ecological constraints wherever practicable. This includes:

- The location of the compressor facility is in an area of non-remnant vegetation, with shrubby regrowth and weedy understorey. This area is not suitable habitat for any of the target threatened species.
- With the exception of the GCF, the remainder of the infrastructure will be installed underground. This was to minimise impact on existing land uses (e.g. grazing) and reduce as far as reasonably practicable impacts of domesticated and native animal movements (connectivity).
- The high-pressure pipeline crossing of Goonyella Creek was chosen as the most viable option as it was considered to generate the least impact when compared to Mabbin Creek and Gum Tree Creek. The creek is unformed in the vicinity of the crossing with no definable banks.

- The high-pressure pipeline alignment will follow existing clearings (e.g. pulled and cleared pasture, fire breaks, fence lines, access tracks) where practicable to minimise disturbance on the surrounding environment.
- High-pressure pipeline and rail crossing in the same vicinity.
- The chosen access route was deemed as the most viable route due to minimised distance and impact to remnant vegetation.

Constraints relating to MNES are outlined in this technical report.

8.4 Potential impacts from the Project

Throughout the construction, operation and decommissioning phases, the Project has the potential to impact MNES values through the following activities:

- loss of habitat as a result of vegetation clearing
- habitat fragmentation
- fauna injury or mortality during vegetation clearing
- fauna injury or mortality as a result of vehicle strike
- disturbance to wildlife during construction as a result of noise, light and vibration
- erosion and sedimentation which may impact on water quality
- potential spills of hazardous materials
- increase in numbers of pest animals and weeds due to increased vehicle movements and opening up areas of remnant vegetation from clearing for infrastructure
- elevated bushfire risk due to increase in activities on site that may cause a fire to start
- alteration of hydrology and water quality.

Direct impacts described in Section 8.4.1 are likely to be irreversible. However, cleared areas will be rehabilitated post construction (see Section 9.12 and Appendix K). Indirect, facilitated and cumulative impacts are unknown and unpredictable. All impacts caused by the Project are permanent, unless stated otherwise.

8.4.1 Direct impacts

Direct impacts occur as a direct result of a project's activities (Franks et al. 2010). This may include impacts from vegetation/habitat clearance or direct mortality of fauna from vehicle strike. Further detail on potential direct impacts that may occur to MNES are summarised below.

i Vegetation/habitat clearance

The Project area supports areas of remnant vegetation and regrowth as well as extensive non-remnant areas which are dominated by gilgai.

Clearing of these habitats will reduce breeding, foraging and sheltering habitat for fauna and flora species, and the process of vegetation clearing has potential to result in injury or mortality of native fauna species. Some species which are more sedentary (e.g. reptiles such as Ornamental Snake) are more prone to impact than others. Conversely, mobile species such as Squatter Pigeon and migratory birds, with broader habitat preferences, are unlikely to be impacted from vegetation clearing as they are more mobile and can disperse more easily.

The site layout has evolved to minimise vegetation clearing and impacts on MNES habitats. This has included:

- The location of the compressor facility is in an area of non-remnant vegetation, with shrubby regrowth and weedy understorey. This area is not suitable habitat for any of the target threatened species.
- The high-pressure pipeline alignment will follow existing clearings (e.g. fence lines, pulled and cleared pasture, firebreaks, access tracks) where practicable to minimise disturbance on the surrounding environment.
- The chosen access route was deemed as the most viable route due to minimised distance and impact to remnant vegetation.

The total estimated area of vegetation clearing is 8.04 ha of remnant vegetation, 0.37 ha of mapped high-value regrowth vegetation and 56.64 ha of non-remnant areas as outlined in Table 8.1. Estimated (maximum) clearance for each MNES potential habitat is in Table 8.2 Specific impacts for each MNES are outlined in Chapter 10.

Table 8.1 Summary of ground-truthed REs in the Project footprint

RE	RE description	Remnant (ha)	HVR (ha)
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces	4.74	0
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	3.04	0.37
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks	0.26	0
Non-remnant		56.64	

Table 8.2 Estimated clearance of MNES habitat

Species	Habitat type	Total habitat within Project footprint (ha)	Total habitat within Project area (ha)
Brigalow TEC	N/A	0.8	
Ornamental Snake	Breeding	36.05	116.56
	Dispersal/connectivity	19.62	40.69
Squatter Pigeon	Breeding	9.55	22.10
	Foraging	19.98	43.25
	Dispersal	2.15	5.48
Koala	Potential	5.0	17.03

Table 8.2 Estimated clearance of MNES habitat

Species	Habitat type	Total habitat within Project footprint (ha)	Total habitat within Project area (ha)
White-throated Needletail	Foraging	58.01	149.15
	Roosting	7.04	30.64
Fork-tailed Swift	Foraging	65.05	
Latham's Snipe	Foraging	36.05	116.56

ii Species mortality

Direct fauna mortality may occur as a result of the Project during vegetation clearing (e.g. through removal of mature trees containing hollows), digging up breeding places such as reptiles residing under rocks, or vehicle collision. In particular for pipeline projects, direct mortality of native fauna may occur through construction of the pipeline trench (through overnight entrapment or direct mortality during earthworks). This will involve removal of ground vegetation, soil and rock which provide fauna habitat.

During trenching activities there is potential for fauna to fall into and become trapped in open trenches, where they may perish or become subject to increased predation risk if not removed in a timely fashion each morning in accordance with normal operating procedures. Particularly susceptible species groups include reptiles, frogs and small mammals.

Increased traffic around the Project area has the potential to kill or injure fauna on impact. Some species may be particularly susceptible to traffic impacts; mainly ground-dwelling or slow-moving species.

Direct mortality of flora may occur through trampling or destruction of individuals from vehicle or personnel movement.

8.4.2 Indirect and facilitated impacts

Indirect impacts can be produced away from the Project or as a result of a complex impact pathway (Franks et al. 2010). Such indirect impacts include fragmentation, bushfire risk, extreme environmental events, erosion and water quality, noise and lighting, reduced air quality, weeds and pests and alienation. Facilitated impacts result from further actions (including actions by third parties) which are made possible or facilitated by the action. This is included as an indirect impact.

Beyond the defined project area, the NQGP transports the compressed gas north to Townsville, where in turn it will be depressurised and distributed, by a third party, to industrial users, including the QPM TECH Project. It should be noted that existing and proposed upstream, mid-stream and downstream infrastructure operated by third parties do not form part of this referral and will be/have been regulated under independent approvals frameworks at the local, State and Commonwealth levels. For the sake of clarity, this referral does not include any upstream gas field development, as this has been authorised beneath existing State and Commonwealth approvals for existing surrounding coal mining operations and, in some cases, overlapping Petroleum Licenses.

QPM's Energy Project will support projects such as the TECH Project by utilising waste coal mine gas from the Bowen Basin which would be either flared or directly emitted to the atmosphere as a fugitive emission of methane which has a Global Warming Potential factor of 28 times that of carbon dioxide. Dual benefits of capturing and consuming gas that would otherwise contribute significantly to Global Warming and manufacturing battery grade minerals to support the ongoing electrification of the automobile industry. Downstream users of the gas will be subject to their own planning and environmental approvals, and do not form part of this referral.

Further detail on potential indirect and facilitated impacts that may occur to MNES during construction are summarised below.

i Fragmentation

Terrestrial habitat connectivity may be reduced as a result of a Project due to clearing which has potential to reduce fauna movement between areas of retained remnant or regrowth vegetation. Such habitat fragmentation is more prominent where clearing widths are larger, such as over 100 m (construction corridor is 30 m wide and largely co-located with existing fencelines), and intersect intact areas of vegetation. Clearing linear widths through habitats also has the potential to increase edge effects (additional light entering forest, weed encroachment, feral animal abundance may increase and increased risk of bushfire) which has a negative impact on ecological functions for those areas.

Some species are more prone to this fragmentation of habitat. Other species such as Squatter Pigeon are not likely to be impacted by these cleared areas as they are known to disperse quite readily across non-remnant areas, and have commonly been found on existing dirt access roads.

Post-construction, the easement will shrink to a 15 m operating width (i.e. 30 ha) which comprises the 11 m to the high-pressure pipeline centreline. This section typically includes a fence and farm track/firebreak running each side of a fenceline plus 4 m to the other side of the pipeline to allow pipeline remediation, if required. This approach will keep occasional inspection access to an existing farm track which will enable the remaining area to rehabilitate.

Terrestrial habitat connectivity in the vicinity of the GCF may be disturbed as a result of the Project by obstructing movement of fauna across the 200 m x 300 m fenced area, although this area contains non-remnant vegetation.

However, much of the proposed disturbance has been focused along existing cleared fence lines in these areas and is considered very unlikely to pose an ongoing issue to habitat connectivity following the construction disturbance and subsequent revegetation and maintenance of the corridor. Any impacts to remnant vegetation that are unavoidable have sought to clear areas adjacent to existing clearance, to avoid further fragmentation.

There is one waterway passing through the alignment – Goonyella Creek. The crossing of this minor watercourse which is perpendicular to the pipeline corridor is unlikely to be impacted in terms of fragmentation.

Large areas of habitat surrounding the alignment will not be impacted and will be retained, including extensive areas of gilgai. This will ensure the EVNT species likely to utilise the Project area still have large areas that be utilised as corridors, including to habitats outside the Project area.

Weed management, pest animal management and bushfire management will be implemented to minimise environmental impacts from the Project on native species and habitats.

Once the project is operational, the operating infrastructure has the potential to influence fauna behaviour particularly the 6 ha compression facility. There may be localised displacement in the area around the Gas Compression Facility due to increased activity in the area and noise. Due to the avoidance of main areas of remnant vegetation in the vicinity, and the lack of particularly sensitive species to barrier effects, this is not anticipated to be a significant issue for the Project.

ii Changes in water quality and hydrology

Potential surface water related impacts associated with the construction, operation and decommissioning of the Project are categorised as follows:

- altered surface water quantity (streamflow, surface water availability and flood regime)
- altered surface water quality (concentration of salts, increased nutrients, sediment load and turbidity, and other important physical and chemical water quality constituents)

- altered surface water-groundwater interaction.

Potential impacts to baseline water quality and hydrological characteristics (include geomorphology) during construction and operation have been assessed as part of the surface water study (EMM 2022). A summary of the potential impacts relevant to MNES is summarised below.

The main construction activities that could impact on water quality are excavations and earthmoving for construction of the high-pressure pipeline, access road and compression facility, as well as other ancillary infrastructure. This may lead to erosion and sedimentation, reduction in water quality and changes to water flows, if it occurs during periods of rainfall.

During construction activities, sediment may be mobilised and transported by surface water during rainfall events, ultimately discharging into watercourses and drainage lines and potentially reducing water quality in downstream aquatic habitats. Increased suspended sediments can reduce light penetration into the water column, reducing photosynthesis of aquatic macrophytes, and decreasing dissolved oxygen levels. However, watercourses and drainage lines in the Project area are ephemeral (including Goonyella Creek), which may reduce the magnitude of these impacts.

Goonyella Creek would be crossed during dry weather conditions using conventional open cut methods to minimise impacts. Retained vegetation in between will act as a buffer to potential sedimentation impacts.

Changes in the hydrology of the Project area may occur through alteration of surface flows and stormwater runoff, including obstruction of flow.

During construction and operation, the accidental release of pollutants (including spills from construction vehicles and plant, leaks and other uncontrolled releases) into the surrounding environment and waterways has the potential to degrade aquatic habitat quality in the Project area and impact vegetation communities and terrestrial fauna utilising these areas although the Gas Compression Facility is embankment bunded in addition to area bunding). This includes direct toxic impacts on fauna from ingestion or inhalation. Without mitigation, contaminants may enter waterways including oily wastewater (from heavy equipment cleaning), contaminated runoff from chemical or fuel storage areas and general washdown water although there are limited waterways in the Project area for this to be applicable. Nonetheless mitigation is described in Section 9.5.

Impacts to groundwater are not anticipated from the Project. There will be no extraction of groundwater therefore there are no pathways through which the quantity of groundwater can be impacted (earthworks will be at or near ground surface level). Release of pollutants or contaminated runoff from the Project area have the potential to impact on groundwater quality. However, Project infrastructure will be designed and constructed to ensure that water quality objectives are met, and pathways to impact surface and groundwater quality are minimised.

Project pipeline construction works and therefore potential sedimentation impacts will be temporary. No further potential for impacts are expected following construction and subsequent revegetation and maintenance of the corridor.

The proposed water management approach is currently being designed with consideration of several key water management objectives, including:

- progressive rehabilitation of disturbance areas anticipated to minimise the potential for erosion and sediment incidents occurring
- the construction right of way (ROW) will be reduced to an operating easement, with much of the ROW being rehabilitated (exception of a maintenance road)
- the maintenance road surface material will be fit for purpose to avoid scouring and reduce the potential for increased sediment loads in surface water run-off

- an oily water treatment unit will be installed and utilised during the operational phase of the project to separate oily water
- separated oily water will be trucked off-site and processed at an existing registered water treatment facility and the clean water returned to the relevant mine site to meet their regulatory requirements for water management
- the depth of the high-pressure pipeline has been assessed and is not anticipated to impact on groundwater resources.

Detailed Environmental Management Plans for construction and operation (CEMP and OEMPs) will be prepared that identifies management measures to be implemented during construction (clearing and earthworks) and operation. Engineering design and industry operating procedures have been committed to by QPM Energy to ensure deleterious substances do not leave site via overland flows, and erosion does not occur.

iii Bushfire risk

Fire is a natural part of the Australian landscape, and most vegetation communities are adapted to periodic fires. However, changes in the natural fire regime may result in changes in the species composition and/or structure of the vegetation. The increased presence of construction vehicles and personnel in the Project area may increase fire risk through use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.

A Project CEMP and Operational Environmental Management Plan (OEMP) will be prepared that collectively identify how fire will be avoided and managed during all phases of the Project. It will be important that any fires started from site activities are put out quickly and no unplanned bushfires occur. Fuel loads will need to be managed across the Project area, and bushfire buffers to infrastructure maintained.

iv Noise and lighting

Noise may adversely affect fauna by interfering with communication (e.g. territorial bird song), masking the sound of predators and prey, slowing avoidance reactions and motivating displacement from habitat. Construction noise will be generated by the Project through the use of machinery, plant, and vehicles and will vary from short intermittent noise from plant and equipment to more persistent noise from generators and mobile equipment. The generation of construction noise may be in areas which have the potential to support threatened fauna species. Many animals react to new noise initially as a potential threat, but quickly 'learn' that the noise is not associated with a threat (Radle 2007). Individuals that occur on or near the Project area may leave the area of impact. Project construction works and therefore potential noise impacts will be temporary.

Artificial lighting from infrastructure and machinery may impact fauna within the Project area during construction. Artificial lighting can have a range of impacts which vary between species. Artificial light can disrupt patterns of both nocturnal and diurnal species by eliciting responses. Some species may avoid brightly lit areas, potentially due to the perception of being increased risk of predation. Species such as Sugar Glider (*Petaurus breviceps*) have been shown to reduce foraging time under artificial lighting in laboratory conditions (Barber-Meyer 2007). Other potential adverse impacts include disruption of breeding and migratory patterns, disorientation and potential collision with structures.

Conversely, some species such as nocturnal reptiles, frogs and bats may congregate at artificial light sources to feed on insects attracted to light.

Site lighting will be kept to the minimum needed for safety during operation of the Project and very minimal lighting will be required during construction. Wherever practicable, construction activities will be limited to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat. The site is not typically manned during night-time which further promotes low lighting.

v Reduced air quality and dust emissions

Increased dust from vegetation clearing, soil stripping and vehicle movements during construction has the potential to temporarily and locally impact flora and fauna values in the vicinity of the Project footprint. Excess generation of dust is also a construction problem. Subsequent deposition on leaves can impair plant photosynthesis and productivity (also resulting in reduced habitat quality for fauna), impact on respiratory systems of fauna, alter soil properties impacting on plan species assemblages and reduce water quality in aquatic habitats.

Dust is expected to potentially be an issue during vegetation clearing and construction. Dust levels will be monitored and when needed dust suppression implemented such as wetting down dirt roads or reducing vehicle speeds. These measures will be further defined within the Project CEMP and are an essential part of the construction process.

vi Weeds and pests

Project activities have the potential to increase the abundance of pest flora in the Project area and facilitate dispersal of species to previously unimpacted areas. For linear projects such as pipelines across multiple properties, varying level of weed infestation can be a significant issue.

Uncontrolled movement of vehicles, equipment and personnel throughout the Project area is the key vector of transmission, in particular vehicles and equipment sourced from regions beyond the Project area which may introduce new species. Many weed species thrive on ground disturbance and will rapidly colonise disturbed areas in advance of native species recolonisation.

Pest and weeds may pose a significant threat to flora and fauna values adjacent to the Project area and the productive capacity of adjacent agricultural and grazing lands. Much of the grazing lands already contains a proportion of introduced grass species designed to improve the grazing capacity of the land. Species such as Buffel Grass are a significant component. Weeds such as Prickly Pear (occasional plants) and Parthenium were encountered during the surveys.

Increased pest flora abundance has adverse impacts on native vegetation and biodiversity, as well as potential negative economic effects on local land uses such as grazing activities.

Project related activities may also increase pest fauna abundance in the Project area. This can lead to increased competition with, and predation of native fauna. In addition, habitat degradation may occur through vegetation trampling. Creation of new access points into areas of intact vegetation may create pathways for feral fauna species to disperse. In addition, the creation of artificial water sources may increase the capacity of the area to support feral species such as Cane Toads. Uncontained waste sources may also attract feral fauna such as Wild Dog.

9 Impact management and mitigation

The approach used to assess Project impacts utilises proven mitigation measures that have been successfully implemented, or are standard practice. Mitigation measures which have not been proven, or are not known to be successful, have not been considered in the management actions outlined below. Without evidence of the effectiveness of mitigation, the precautionary principle is applied. Avoidance and minimisation through design has been prioritised as the most effective measure (see Section 8.3.1).

This section is supported by draft management plans – these plans will be finalised prior to commencement:

- *Vegetation Management Plan* (VMP) (refer Appendix H)
- *Fauna Management Plan* (FMP) (Appendix I)
- *Draft Environmental Management Plan* (EMP) (refer Appendix J)
- *Draft Rehabilitation Strategy* (refer Appendix K)
- *Draft Construction Weed and Pest Management Plan* (Appendix L).

QPM Energy and associated contractors will be responsible for implementing all avoidance and mitigation measures, except where landowner agreements specify otherwise.

9.1 Management principles

All MNES management and mitigation measures will be developed to align with the S.M.A.R.T principle, to ensure that measures are:

- Specific – prescriptive, with no uncertainty or ambiguity around their purpose or implementation.
- Measurable – the status (i.e. success or failure) and outcomes/results can be measured.
- Achievable – through the chosen method of implementation, by the responsible personnel and within the specified timeframe.
- Relevant – to the action/impact being controlled and to the protected matter.
- Time bound – measures were given specific and achievable timeframes for implementation in relation to specific development activities or stages.

Management measures and performance outcomes are detailed in the management plans prepared and included as appendices to this report.

9.1.1 Selection of mitigation measures

The approach used to assess Project impacts and identify mitigation measures has used measures proven to be successful or are considered standard practice. Mitigation measures which have not been proven, or are not known to be successful, have not been identified in the management actions outlined below. Without evidence of the effectiveness of mitigation, the precautionary principle is applied. Avoidance and minimisation have been prioritised as the most effective measure.

9.2 Avoidance and minimisation

Further to the ecological input into Project design described in Section 8.3.1, the following general measures will be implemented to avoid and minimise environmental impacts to the greatest practical extent:

- Vegetation clearing will be limited to those areas required for earthworks and construction of the Project. Those areas which are not required for the ongoing operation and maintenance of the Project will be rehabilitated as part of the construction process. Rehabilitation will be detailed in a Vegetation Management Plan (VMP) to be prepared prior to commissioning of the Project.
- The approved disturbance area will be clearly demarcated prior to clearing to avoid unnecessary clearing of vegetation and to ensure personnel and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the CEMP and addressed in site inductions.
- Clearing limits will be clearly demarcated on site, including through use of temporary fencing (e.g. flagging tape to mark out areas or plastic mesh fencing installed with star pickets) to avoid unintentional access to retained sensitive environmental areas.
- Large hollow bearing trees should be clearly marked for avoidance during construction if practicable.
- Sequential clearing of remnant vegetation will occur to minimise impacts on native fauna, particularly arboreal fauna which may be using tree hollows. This is discussed further in Section 9.3.
- Access points have been identified and are limited to approved access roads and tracks.

9.3 Vegetation and habitat clearance

The following measures, listed in Table 9.1, will be implemented to mitigate and manage impacts as much as practicable during vegetation clearing.

Table 9.1 Vegetation and habitat clearance mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Develop a Species Management Program (required by DES under the NC Act when impacting on animal breeding places) to identify specific measures to be implemented that will mitigate impacts to threatened fauna species and animal breeding places during clearing, as well as operation of the Project. Measures will include sequential clearing, presence of a fauna spotter catcher and reducing vehicle speeds to minimise any wildlife injuries and to reduce dust.	SMP – requirements for tampering with a protected animal breeding place in Queensland	All MNES	Prior to clearing and during clearing

Table 9.1 Vegetation and habitat clearance mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Prior to any clearing activities, pre-clearance surveys will be undertaken by a suitably qualified ecologist to: – further identify MNES and other native fauna species habitats and clearly demarcate the habitats being retained to ensure no direct or indirect impacts occur during clearing and construction – searches for threatened grasses in suitable habitat – identify and mark hollow-bearing trees to ensure they are managed by the fauna spotter catcher during clearing phase – identify and mark any other active breeding places such as nests, burrows etc to ensure they are managed by the fauna spotter catcher during clearing phase – identify suitable release sites should any fauna species need to be captured and released during clearing phase – identify presence of weed species and identify if any require treatment prior to clearing.	N/A	All MNES	Prior to clearing
• A suitably qualified fauna spotter-catcher will be present during clearing activities, working under a DES approved Species Management Program under the NC Act. The fauna spotter-catcher will be responsible to check an area immediately prior to any clearing for; presence of any native fauna including searches of all potential habitats such as terrestrial microhabitats and hollows, etc. Any captured species (excluding Koalas) will be relocated to an agreed release site. The fauna spotter-catcher will then advise the ground staff as to measures that need to be taken to avoid impacts on breeding places and fauna species. Specific threatened species pre-clearance activities within the Project footprint will include: – canopy searches in suitable foraging tree species for Koala – searches of gilgai habitats for Ornamental Snake – searches of open woodland habitat for Squatter Pigeon nests.	SMP—requirements for tampering with a protected animal breeding place in Queensland Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld)	All MNES	Prior to clearing

Table 9.1 Vegetation and habitat clearance mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Sequential clearing will occur in areas where remnant vegetation is to be cleared. Key steps as part of sequential clearing are summarised below and will be formalised in a protocol as part of the Species Management Program to be prepared under the NC Act: – The first phase will consist of removing understorey vegetation and smaller juvenile trees only. Juvenile trees are under 4 m in height or trunk circumference of less than 31.5 cm at 1.3 m above the ground. No hollow-bearing trees will be cleared in Phase 1. – After 48 hours the second phase can commence which is to clear the remaining larger trees, including those with hollows. Where practicable hollow bearing trees are to be "soft felled" to minimise the risk to hollow dwelling fauna. They will then be inspected by the fauna spotter-catcher post-felling to ensure no wildlife remain in the hollow. Where practicable fauna will be caught, and released into suitable recipient sites once clearing has stopped. If roosting bats are located they are to be "roosted" during the day in a safe, cool, dark space and released at night in areas of habitat to be retained. – Dispersal corridors will be left in place that link vegetation with clearing areas to adjacent areas of retained habitat, and are to be maintained for a further 24 hours, to facilitate overnight dispersal. Such corridors will act as 'stepping stones' to allow any Koala present to depart to retained vegetation. – If any native fauna are injured they will be taken to a local vet/wildlife carer for treatment. – It is important the clearing is done in such a way that arboreal fauna are given the opportunity to disperse from the area once clearing has commenced under their own volition. – Any confirmed Koalas will be identified by putting flagging tape and/or marking spray on the tree they are in, and any nearby trees with overlapping crowns or those trees that may impact the Koala's tree during felling will not be cleared until the Koala has moved from the area under its own volition. In most situations the Koala will move from the area overnight. – Fell trees away from retained areas of vegetation where practicable. Where trees unavoidably fall into retained areas, leave in-situ to mimic natural tree fall and provide habitat for ground-dwelling fauna. – Fauna spotter catcher will undertake a final walkthrough ahead of the clearing machinery on the day of clearing checking for breeding places, flipping over timber and peeling bark to relocate fauna, and identifying the potential breeding places marked in the preclearance breeding survey and liaising with the machinery operator over their presence and appropriate clearing techniques.	EPBC Referral Guidelines for the vulnerable Koala	Koala	During clearing
• Spotlighting pre-clearance surveys will occur in mapped areas of Ornamental Snake preferred habitat prior to vegetation and topsoil clearing taking place in the summer months (October to March). If any individuals are caught they will be released in adjacent suitable habitats which are being retained outside of the Project area away from clearing.	N/A	Ornamental Snake	Prior to clearing

Table 9.1 Vegetation and habitat clearance mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• The eastern end of the new alignment is mapped as high risk for protected plants. This is due to records of *Dichanthium queenslandicum*. Although none were recorded in the June 2022 survey, and most grasses were flowering, a formal protected plant survey needs to be undertaken in areas of high-risk trigger mapping within 12 months of clearing (a requirement under Queensland legislative framework).	-	All MNES	Prior to clearing

9.3.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Fauna spotter catchers will monitor vegetation clearing occurring and ensure that sequential clearing is occurring and clearing limits are being adhered to. Corrective actions include:
  - Replace any fencing or flagging tape that is in poor condition.
  - Where clearing extends outside the approved disturbance limits, a record must be taken of the incident and an investigation will occur.
  - Revegetation of additional cleared areas will be discussed and where required undertaken.
  - Any fauna injuries or deaths are required to be reported to DES and/or DCCEEW. Investigate cause of injury or death and implement any changes needed (fauna management is detailed further in the Fauna Management Plan (Appendix I).

9.4 Fragmentation

The following measures will be implemented to mitigate and manage impacts of fragmentation as much as practicable during the construction and operational phases.

Table 9.2 Fragmentation mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
All fencing at the GCF, including security fencing, will give consideration to the movement of fauna where practicable. Fencing design will consider common mitigations to prevent entanglement of wildlife, and not using barbed wire on the top strand of fences, if security or land management practices allow.	DTMR's Fauna sensitive road design manual Vol 2	Koala	Detailed designs
Install fauna exclusion fencing around the GCF to reduce the risk of fauna species being impacted.	DTMR's Fauna sensitive road design manual Vol 2	Koala	During construction
Undertake staged clearing of native vegetation, and retain habitat trees where practicable, to minimise impacts to native fauna species.	EPBC Referral Guidelines for the vulnerable Koala	All MNES	During clearing

Table 9.2 Fragmentation mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
Implement weed and pest control across the Project area to reduce degradation of habitats and edge effects as a result of the Project.	N/A	All MNES	All times
Retained vegetation will be maintained following a site VMP to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and reduce disturbance to surrounding habitat. The Project VMP will be developed prior to construction and include the following components outlined in Table 9.1. A brief summary of the scope and content of the plan is also provided.	VMP (refer Appendix H)	All MNES	All times

The Project VMP will be finalised prior to construction and include the following component outlines in Table 9.3. The VMP is attached as Appendix H.

Table 9.3 Structure and content of site Vegetation Management Plan

Aspect	Scope and content
Access control	Unless approved by the Site Manager; vehicles and equipment are to remain on defined roads and designated areas. Access to be highly restricted to retained areas of vegetation during operational phase except for land management activities. Limiting the disturbance of vegetation – flagging of buffer areas to prevent incursion into retained vegetation; no collection of timber or firewood from areas to be protected; retaining riparian vegetation. Protocols around how clearing limits are to be defined will be established, including monitoring of clearing limits and record keeping requirements. Maintenance checks of fencing during operations will be incorporated twice a year.
Vegetation clearing	Protocols around the staged clearing of vegetation during construction will be established as detailed in Section 9.2.
Bushfire	Requirements for monitoring of fire status will be established (daily checks).
Dust	Dust mitigation to reduce the impact to and function of retained vegetation in the Project area. Protocols for site inspections and habitat monitoring.
Revegetation/ rehabilitation practices	Protocols for salvaging topsoil for use in rehabilitation activities; revegetation or regeneration of areas that will not continue to be disturbed by site operations; revegetation with indigenous plant species. Tree species selected will be consistent with regional ecosystems present on site.
Weed control	Weed species management will be established- for example requiring all plant and equipment to be free of soil and weed seeds prior to entering the site; minimising the use of chemicals and fertilisers, ongoing weed management of retained vegetation areas on site. Requirements for weed mapping to provide a baseline of existing weeds and weed infestation areas within and immediately adjacent to the disturbance footprint will be established. Protocols to check wash-downs are occurring in an effective manner will be established including audits and checks of certificates. Requirements for weed survey during construction and operation will be set-out as well as appropriate corrective actions (e.g. amending weed control methods, or frequency of control).
Erosion	Bi-annual assessment of erosion and sediment loads. Site inspections to assess erosion and sediment control measures (monthly or post heavy rainfall events) plus inspection of hazardous material storage areas (and storage ponds).

9.4.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- All areas of fencing during construction will be inspected as part of regular worksite inspections. Areas of higher risk exclusion fencing will be inspected at least weekly. Corrective actions include:
  - repair of any fencing found to be in poor condition or broken, and inspection of areas inside the damaged fencing to ensure no fauna species such as Koala are trapped.

9.5 Erosion and sedimentation

The following measures will be implemented to mitigate and manage impacts of erosion and sediment as much as practicable during the construction and operational phases.

Table 9.4 Erosion and sedimentation mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
Erosion in active construction areas cannot be eliminated but can be controlled. As part of the construction planning a certified Erosion and Sediment Control Plan (ESCP) will be prepared prior to construction and implemented during on-site activities. Sediment and erosion control measures to prevent soil loss will be developed consistent with the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (BPESC) document. The ESCP will form part of the overall CEMP (a draft CEMP is provided as Appendix J). Particular focus will be given to managing runoff in the vicinity of watercourses.	IECA BPESC document	All MNES	Detailed designs and implemented during construction
Design on site infrastructure to ensure water flows are not impounded or concentrated (e.g. culverts, diversion ditches, etc).	N/A	All MNES	During clearing and construction
The only open cut creek crossing location – Goonyella Creek – will take advantage of existing areas of cleared riparian vegetation as far as possible, and be carried out during periods of no flow. It is not a formed creek with defined banks.			
No equipment or materials will be stored across flow paths.	N/A	All MNES	Construction and operation
The extent of the area required to carry out the permitted activity must be limited to the minimum area necessary to reasonably carry out the works.	N/A	All MNES	During clearing and construction

9.5.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Daily dust suppression monitoring during clearing and construction. Corrective actions include:
  - Further wetting down roads to suppress dust.

- Temporary reductions in speed limits.

- Daily weather observation checks during clearing and construction. Corrective actions include:
  - Cease works until weather passes to minimise sediment runoff and dust.
- Weekly checks of erosion and sediment control measures to ensure they are in working condition and effective. Corrective actions include:
  - Cease works until weather passes to minimise sediment runoff and dust.
  - Implement additional erosion and sediment control measures if existing measures are not proving effective.
  - Notify government agencies of any spills and implement clean up measures required.

9.6 Changes to water quality

The application of mitigation measures relevant to water quality will be ensured through the future conditions of an environmental authority (issued by DES). A comprehensive suite of mitigation and management measures for water quality has been prepared and detailed within EMM 2022a. In summary, the following measures will be implemented to mitigate and manage impacts on water quality as far as practicable during the construction and operational phases.

Table 9.5 Avoidance and mitigation measures

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Construction equipment is to be maintained to minimise risk of spill or leakage.	N/A	All MNES	During clearing and construction
• All refuelling facilities, or storage facilities for hydrocarbons and chemicals will be in appropriately designed sites and comply with Australian Standards (e.g. AS 1940: *The storage and handling of flammable and combustible liquids*). Materials will be stored within bunded areas with a storage capacity of 110% of the storage vessel. Bunding will have floors and walls lined with impermeable material. These areas must be adequately protected from rainfall and stormwater.	AS-1940	All MNES	At all times
• Refuelling should not take place within 50 m of a watercourse.	N/A	All MNES	At all times
• Spill control materials such as booms and absorbent materials will be maintained on site, commensurate with the types and volumes of materials in use, and in place where hazardous materials are stored or used.	N/A	All MNES	At all times
• Personnel will receive appropriate spill clean-up training.	N/A	All MNES	At all times

Table 9.5 Avoidance and mitigation measures

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Apply appropriate Australian and industry standards and codes of practice for the design of infrastructure associated with the storage of hazardous materials. Reagents and hazardous chemicals will be stored away from sensitive receiving environments and stored, handled and managed in accordance with: – relevant workplace health and safety (WHS) legislation – AS 1940:2017 *Storage and Handling of Flammable or Combustible Substances* – AS 3780:2008 *The Storage and Handling of Corrosive Substances*.			
• Chemical storage areas are to be located away from existing drainage lines and have appropriate bunding and waste water collection mechanisms.	N/A	All MNES	During detailed design and implemented in operations
• Water and wastewater discharges will be treated to comply with conditions for discharge quality specified in the future environmental authority.	N/A	All MNES	During detailed design and implemented in operations
• Runoff from developed areas will be treated to remove pollutant loads before discharging to waterways. The expected pollutant loads from the respective areas will determine the method of treatment.	N/A	All MNES	During detailed design and implemented in construction and operation
• During detailed design, issues relating to site runoff entering into drainage lines will be considered. These will include the preparation of a Stormwater Management Plan.	N/A	All MNES	During detailed design and implemented in construction and operation
• Water drainage from the site will be managed in accordance with the surface water management design philosophy detailed in (EMM 2022a).	N/A	All MNES	During detailed design and implemented in construction and operation
• Safety procedures will be developed to reduce the potential for exposure pathways to contaminated material.	N/A	All MNES	At all times

9.6.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Monitoring will be undertaken surrounding the development to characterise areas of potential contamination and monitor for any releases of contaminants. The monitoring would include soil, sediment, surface water in areas of concern and within down-gradient locations. This may take the form of visual monitoring initially depending on risk profile but will be confirmed in the CEMP prior to construction.

Corrective actions will involve investigation of the source of any contamination, and undertaking of repairs or replacement measures, as well as remedial actions as required.

9.7 Bushfire

The following measures will be implemented to mitigate and manage impacts from bushfire risks as much as practicable during the construction and operational phases.

Table 9.6 Bushfire risk mitigation and management actions during construction

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• As part of the construction planning a certified Bushfire Management Plan will be prepared prior to construction and implemented during on-site activities. This will include details of controlled burning requirements, appropriate to the vegetation types present on the Project area. This will seek to manage the fuel load to reduce the risk of high-intensity fires occurring. The Bushfire Plan key provisions will include: – asset protection zones – maintaining access tracks to provide a fire break and defendable space to assist in arresting fires – bushfire risk mapping (considering slope, vegetation, aspect etc.) – firefighting equipment being on site – emergency evacuation.	RFS guidelines	All MNES	At all times
• During the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website. Contact and arrangements will be made with the local fire officers.	RFS guidelines	All MNES	At all times
• For "hot-work" activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions.	N/A	All MNES	At all times
• Vehicles may not idle or be parked in areas of long grass.	N/A	All MNES	At all times
• Smoking will not be permitted on site aside from designated safe zones.	N/A	All MNES	At all times

9.7.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions.

- Monthly assessment of fuel loads. Corrective actions include:
  - If fuel loads are increasing due to rainfall, review current measures and increase if required.
- During construction phase, and in the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website. Corrective actions include:
  - An Emergency Response Plan will be implemented should an uncontrolled fire take place.

9.8 Noise and lighting

The following measures will be implemented to mitigate and manage impacts from noise and lighting as much as practicable during the construction and operational phases.

Table 9.7 Noise and lighting mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/ case study	Relevant MNES	Timing
• Lighting from Project activities will be minimised at night to reduce light spill disturbance to nocturnal fauna.	N/A	All MNES	During clearing, construction and operation
• Night lighting will mainly be limited to that required for safety and security. Project lighting will be minimised (i.e. low luminance) as far as possible	N/A	All MNES	During clearing, construction and operation
• Directional lighting should be away from environmentally sensitive areas.	N/A	All MNES	During clearing, construction and operation
• All equipment will be properly maintained onsite in accordance with manufacturers specifications.	N/A	All MNES	During clearing, construction and operation
• Implement noise control techniques in accordance with standard industry noise suppression techniques.	N/A	All MNES	During clearing, construction and operation

9.8.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Monitor noise levels during construction and determine acceptable noise limits. Corrective actions include:
  - Where noise levels go beyond acceptable limits, a record must be taken of the incident and an investigation will occur.

9.9 Dust emissions

The following measures will be implemented to mitigate and manage impacts from dust as much as practicable during the construction phase.

Table 9.8 Dust mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Areas which have potential to generate airborne dust will be wetted down regularly.	N/A	All MNES	During clearing and construction
• Low speed limits will be implemented on site to minimise dust generation.	N/A	All MNES	At all times
• Areas stripped of topsoil not required for operation will be rehabilitated as soon as practicable.	N/A	All MNES	During clearing and construction
• Machinery and vehicle tyres will be regularly cleaned to reduce wheel entrained dust emissions or consider use of vibration grids.	N/A	All MNES	During detailed design and implemented during clearing and construction
• Design access roads to have a less erodible surface.	N/A	All MNES	During clearing and construction
• Water spraying of nearby sensitive vegetation should be considered if visible dust sedimentation is observed.	N/A	All MNES	At all times
• Dust and other emission levels will be adhered to under the State conditions of approval.	N/A	All MNES	During operation

9.9.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Daily dust suppression monitoring during clearing and construction. Corrective actions include:
  - Further wetting down roads to suppress dust.
  - Temporary reductions in speed limits.
- Daily weather observation checks during clearing and construction. Corrective actions include:
  - Cease works until weather passes to minimise sediment runoff and dust.

9.10 Weeds and pests

The following measures will be implemented to mitigate and manage impacts from weeds and pest animals as much as practicable during the construction phase. A draft Weed and Pest Management Plan is provided as Appendix L.

Table 9.9 Weed and pest mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• A Weed and Pest Management Plan will be developed for the Project with specific advice for key identified species. The plan will include management of weed spread, management of pest infestations, and monitoring effectiveness of control measures. The Project area is currently subject to high-levels of weed infestation and, as such, focus is to avoid further impacting the quality of retained areas of habitat along the riparian corridors.	Biosecurity Act requirements and DAF guidelines	All MNES	At all times
• Parthenium weed (*Parthenium hysterophorus*) is abundant along the pipeline alignment, especially at the eastern end near Red Hill Road. This is a declared pest under the Biosecurity Act (QLD) so weed spray out programs and hygiene protocols will need to ensure it is not spread. It is also common on Denham Park.		All MNES	At all times
• Hygiene protocols will be implemented to reduce the potential for introduction or spread of weeds. Measures will include: – Hygiene checks will focus on ensuring no weed plant material/seed/mud/soil material enters the site (or leaves known infestation areas within the site), with all machinery, vehicles and equipment requiring cleanliness certification. Footwear will be cleaned prior to entering the site, and when working within a known contaminated area within the site, prior to exiting the contaminated area.	Biosecurity Act requirements and DAF guidelines	All MNES	At all times
– Onsite waste disposal (especially food waste) to discourage presence of pest fauna. Waste will be stored in covered bins/skips to prevent fauna access.	Biosecurity Act requirements and DAF guidelines	All MNES	At all times
– Weeds will be identified during pre-clearing surveys, in particular, any large infestations within proposed disturbance areas. Spray-out programs will be undertaken on a regular planned basis. Clean and dirty zones should be demarcated on site to facilitate weed management.	Biosecurity Act requirements and DAF guidelines	All MNES	Prior to clearing
– Any materials brought into site (such as gravel) will be certified as weed and disease free.	Biosecurity Act requirements and DAF guidelines	All MNES	At all times
– Any herbicides used on site must be dispensed by an appropriately trained and qualified weed sprayer.	Biosecurity Act requirements and DAF guidelines	All MNES	At all times
– Access into retained areas of habitat during construction will be limited and monitoring of weeds in these areas in place.	N/A	All MNES	At all times

9.10.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Record weed species during pre-clearance surveys, and confirm any large infestations required for treatment prior to clearing. Corrective actions include:
  - Weed control via a weed spray-out program to be coordinated with the Station lessee.
  - Weed control methods to be adjusted if current techniques are not proving effective.

- Check that vehicle are clean and in accordance with certification documents on site entry. Reject uncertified and unclean vehicles entering the site.
- Increase hygiene protocol requirements if vehicles or equipment are found to introduce new weeds.

- Check material being brought into site such as gravel is weed and disease free:
  - Increase hygiene protocol requirements if vehicles or equipment are found to introduce new weeds.

9.11 Species mortality

The following measures will be implemented to prevent species mortality during the construction and operational phases.

Table 9.10 Species mortality mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• All vehicles associated with construction or operational activities will travel at slow speeds to minimise the chance of any fauna strikes occurring. Speed limit signage will be placed at the entrance to the site and other key points.			
• A suitably qualified fauna spotter/catcher will be present during clearing activities associated with the vegetation clearance, working under a Species Management Program. The spotter/catcher will be responsible to check an area prior to any slashing, minor vegetation removal, or ground disturbance occurring for; animal breeding places (such as hollow bearing trees, nests, dens and fallen logs) and presence of any fauna species (such as checking for reptiles under fallen logs, and Koalas within eucalypt trees).	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	All MNES	Prior to clearing and during clearing
• All contractors will be educated on the presence of native fauna including threatened species and need to travel slowly and look out for fauna when driving (especially Squatter Pigeon). This training will form part of mandatory inductions.	N/A	All MNES	At all times
• Vehicle traffic will be confined to designated roads and access tracks.	N/A	All MNES	At all times
• All fauna encountered (e.g. vehicle strike or during clearing activities) will be recorded in a central register by the Project Environment Manager. Any injured fauna will be reported as required in the Species Management Program that will be in place for the Project.	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	All MNES	At all times

Table 9.10 Species mortality mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Appropriate procedures for managing injured wildlife should be developed and included in the CEMP and OEMP (draft OEMP provided as Appendix K).	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	All MNES	At all times
• During trenching activities, open trenches will be monitored daily. If species are trapped in the trench they will be released by a fauna spotter-catcher. The amount of open trench will be minimised.	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	Koalas	During clearing and construction
• Escape ramps or planks and/or shelter (e.g. sawdust filled bags) for trapped fauna will be installed in open trenches.	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	Koalas	During clearing and construction
• Any clearing would take place in a way to allow Koalas (if present) to move into adjacent areas of retained vegetation. This will include setting clearing limits per day and allowing escape paths to retained vegetation to be maintained. If Koalas are encountered they are to be left in-situ, works stop in the area, and wait for the animal to move to retained habitat. This will entail: – Leaving a 30 m buffer of vegetation around the tree in which the Koala is located and a corridor of vegetation to retained habitat. – Monitoring the Koala location and if the animal appears stressed. – Allowing the Koala to relocate without assistance unless the animal is in immediate danger or is injured. Ongoing presence will be managed by the fauna spotter catcher under the Species Management Program.	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	Koala	Prior to clearing and construction

Table 9.10 Species mortality mitigation and management actions

Avoidance and mitigation measures	Relevant guideline/case study	Relevant MNES	Timing
• Spotlighting pre-clearance surveys will occur in mapped areas of Ornamental Snake habitat. If any individuals are caught they will then be released in adjacent suitable habitats which are being retained outside of the Project area.	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	Ornamental snake	Prior to clearing and construction
• For areas where Ornamental Snake were recorded during spotlighting pre-clearance surveys, a fauna spotter catcher will also supervise any earthworks due to the likelihood they could be residing in soil cracks. If any individuals are caught they will then be released that night to adjacent suitable habitats which are being retained outside of the Project area.	SMP – requirements for tampering with a protected animal breeding place in Queensland. Damage mitigation permit (removal and relocation of wildlife) under NC Act (Qld).	Ornamental snake	Prior to clearing and construction

9.11.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- During trenching activities, open trenches will be monitored daily. Corrective actions include:
  - If native fauna become trapped in a trench they will be released by a fauna spotter-catcher.
  - If native fauna are identified within the clearing area, the fauna spotter catcher will seek to capture and relocate them to appropriate habitat nearby. This does not apply to Koalas which are discussed separately in Table 9.11.
  - Any fauna injuries or deaths are required to be reported firstly to the Project Environmental Manager and then DES and/or DCCEEW if it involves a threatened species. The cause of injury or death will be investigated and any required changes will be implemented.
- Vehicle speed limits will be monitored and enforced. Corrective actions include:
  - Increased discussion at toolbox talks and enforcement.

9.12 Rehabilitation

The following measures will be implemented to facilitate rehabilitation within the Project area.

Table 9.11 Rehabilitation actions

Action	Relevant guideline/case study	Relevant MNES	Timing
Those areas which are not required for the ongoing operation and maintenance of the Project will be rehabilitated as soon as practicable following construction.	N/A	All MNES	During clearing and construction
Woody debris, logs and rocks will be retained for use in rehabilitation.	N/A	All MNES	
Where seeding and/or revegetation is required select plant species that are found in similar adjacent habitat on site. Reuse of seed banks contained in topsoil that has been pushed aside for later use will have priority.	N/A	All MNES	

In order to undertake all aspects of rehabilitation, decommissioning of infrastructure is likely to be required. This includes the de-mobilisation and removal of buildings, plant and equipment and hard stand areas. The buried pipeline would remain in place. A Rehabilitation and Decommissioning Management Plan will be developed and submitted to the relevant authority 12 months prior to decommissioning occurring. A draft plan is provided as Appendix L.

Rehabilitation activities are described in Section 4.13.

10 Significant impact assessment

10.1 Summary

Significant impact assessments have been carried out for MNES that are 'known' or 'likely' to occur in the Project area, as well as conservatively for Koala which has low potential to occur. The significant impact assessment has been applied to the current Project area only (however facilitated and indirect impacts to MNES are considered).

Table 10.1 summarises the residual impacts on MNES values and impact assessment findings. Full significant impact assessments applying the Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DoE 2013a) are presented in subsequent sections. The significance of impacts on MNES values have been assessed following consideration of general avoidance and mitigation measures described in Chapter 9, and specific mitigation relevant to each MNES described below in Sections 10.2 to 10.8.

Table 10.1 Summary of significant impact assessment

MNES	Area impacted (ha)	Significant impact assessment – conclusion
Brigalow TEC	0.8	No
Ornamental Snake	36.05 (preferred)	Yes
	19.62 (dispersal/connectivity)	
	55.68 (total)	
Squatter Pigeon	9.55 (breeding)	No
	19.98 (foraging)	
	2.15 (dispersal)	
	31.67 (total)	
Koala	**5.0**	No
White-throated Needletail	**65.05**	No
Fork-tailed Swift	**65.05**	No
Latham's Snipe	**36.05**	No

10.2 Brigalow TEC

10.2.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- community profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=28
- Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community (DoE 2013b)
- Commonwealth Listing Advice on Brigalow (*Acacia harpophylla* dominant and co-dominant) (TSSC 2001)

- Brigalow Regrowth and the *Environment Protection and Biodiversity Conservation Act 1999* Information Sheet (Environment Australia 2001).

10.2.2 Ecology, habitat, distribution

The Brigalow TEC extends from south of Charters Towers in Queensland, in a broad swathe east of Blackall, Charleville and Cunnamulla, and south to northern New South Wales near Narrabri and Bourke. In Queensland, the TEC occurs predominantly within the Brigalow Belt North, Brigalow Belt South, Darling Riverine Plains and Southeast Queensland bioregions, with smaller amounts in the Mitchell Grass Downs, Mulga Lands and Einasleigh Uplands bioregions (DoE 2013b).

The Brigalow TEC is characterised by the presence of Brigalow (*Acacia harpophylla*) as one of the most abundant tree species. Brigalow is either dominant in the tree layer, or co-dominant with other species – notably Belah (*Casuarina cristata*), other species of *Acacia,* or species of *Eucalyptus.* The Brigalow TEC has a considerable range of vegetation structure and composition united by a suite of species that tend to occur on acidic and salty clay soils (DoEE 2013b). In Queensland the dominant soil type is cracking clay. The ground layer is typically sparse, and includes a variety of grasses and chenopods (Butler 2007).

10.2.3 Important populations

Within Queensland, 34 reserves contain remnant Brigalow TEC, the greatest extent of which is in Carnarvon National Park which contains 40% of the reserved Brigalow TEC in Queensland (Butler, 2007). However, 90% of extant Brigalow TEC occurs outside protected areas, with particularly important “off-reserve” areas located in state forests such as Yuleba, Junee, Blair Athol and Barakula, with small remnants particularly including advanced regrowth also important (such as areas between Dysart and Nebo (Butler 2007).

10.2.4 Threats to the community

The current threats to this community relate to clearing, fire, and plant and animal pests (Butler 2007). This community has been extensively cleared for cropping or grazing and subject to altered fire regimes.

Clearing remains the most significant threat, despite restrictions on clearing of remnant areas. Brigalow regrowth is also subject to clearance from a variety of developments, and programs of spraying, grazing and burning can affect the long-term viability of these communities with exotic pasture also causing substantial decline in the diversity of communities.

Pasture grasses such as Buffel Grass remain a significant threat to the TEC, partly due to the increase in fire risk in the vegetation (Butler 2007) as natural fire was probably rare in the TEC (Butler 2007). Communities with a relatively healthy tree canopy are relatively resistant to weed invasion, including from pasture grasses (Scanlan 1991).

10.2.5 Distribution within the Project area

The Project area has been surveyed for the Brigalow TEC. Two patches of Brigalow that meet the requisite condition thresholds to qualify as the Brigalow TEC are present within the Project footprint on Lot 2 (Dabin Station). A further three patches of the Brigalow community occur within the Project area, however are too degraded by weed invasion to meet the condition thresholds that define the Brigalow TEC.

The two Brigalow TEC patches within the Project footprint both contain advanced regrowth of previously disturbed vegetation. The westernmost patch appears to have been disturbed earlier and is characterised by regrowth Brigalow woodland (7–8 m tall) interspersed with Blackbutt-dominated woodland on red-brown sandy clay soils. This is consistent with Endangered REs 11.4.9/11.4.8, however is mapped as High Value Regrowth of Endangered RE 11.8.13, which is described as semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks. Exotic grasses are very sparse in the ground layer, comprising ~5% of cover.

A section of HVR 11.4.9/11.4.8 (Brigalow 5–6 m tall with emergent, interspersed taller Blackbutt to 16 m) is present immediately east of this patch. Exotic grasses are similarly sparse within the patch, with around 5% cover. This patch is incorrectly mapped as a heterogeneous polygon of 'Of Concern' RE 11.8.11/11.8.5, which are grassland-dominant REs that are not present.

The two patches of Brigalow TEC within the Project footprint comprise part of a larger patch of Brigalow with SEVT understorey, which extends to the north of the Project area and will not be impacted. Within the Project area, approximately 0.8 ha of Brigalow TEC occurs within the high-pressure pipeline alignment on Lot 2.

10.2.6 Significant impact assessment

The MNES significant impact assessment for Brigalow TEC using the Significant Impact Guidelines (DoE 2013a) is summarised in Table 10.2.

Table 10.2 Significant impact assessment – Brigalow TEC (status Endangered EPBC Act)

Community profile	**Brigalow (*Acacia harpophylla* dominant and co-dominant) Status: Endangered (EPBC Act)**
SIA criteria (Critically endangered and endangered ecological communities)	**Discussion and justification**
Reduce the extent of an ecological community.	Two vegetation patches of RE 11.4.9 met thresholds for Brigalow TEC in the Project footprint. These consist of a 0.51 ha patch of remnant Brigalow and a 0.29 ha patch of HVR on Lot 2, both within the pipeline alignment on Lot 2. Within the disturbance footprint, the extent of the Brigalow community was mapped in the field, and occurs only on the northern side of the proposed pipeline corridor. The proposed location of the pipeline is along an existing fence line track, so the reduction in extent of the Brigalow community will only be along the very edge of its southern boundary adjacent with the existing fenceline disturbance. Indirect impacts may occur from dust, weed incursion and introduction of fire, however these stressors are already present along the existing fenceline track which is proposed to be utilised for the pipeline. However to ensure bushfire and weeds do not have an indirect impact on the Brigalow patch management actions such as maintaining fire breaks, controlling weeds and hygiene protocols preventing introduction and spread of weeds to site will be implemented over the life of the Project. Pre-clearance surveys will be conducted within the Project footprint before clearing is undertaken, and ecologically sensitive areas will be clearly identified on a constraints map. Clearing boundaries will be clearly marked to ensure no disturbance occurs outside of approved areas. These measures will ensure the extent of the Brigalow TEC is not significantly reduced, however the extent of the Brigalow community will be reduced by 0.8 ha through vegetation clearing.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	The Brigalow TEC extends from south of Charters Towers in Queensland, in a broad swathe east of Blackall, Charleville and Cunnamulla, south to northern New South Wales. The size of many Brigalow remnants across the range of the listed ecological community is small, and the community has been significantly cleared and fragmented historically, however they exist throughout the Brigalow Belt Bioregion. The patch of Brigalow TEC that will be impacted by the pipeline is the southern most extent of a larger patch that extends northwards. As such, the Project will not fragment the existing community.

Table 10.2 Significant impact assessment – Brigalow TEC (status Endangered EPBC Act)

Community profile	Brigalow (*Acacia harpophylla* dominant and co-dominant) Status: Endangered (EPBC Act)
Adversely affect habitat critical to the survival of an ecological community.	The Brigalow TEC patches within the Project area which are advanced regrowth will be cleared, with an estimated footprint of 0.8 ha. Remnant and HVR vegetation surrounding this extent (approximately 60 ha) will be maintained. However, to ensure bushfire and weeds do not have an indirect impact on the Brigalow patches management actions such as maintaining fire breaks, controlling weeds and hygiene protocols preventing introduction and spread of weeds to site will be implemented over the life of the Project. The small amount of habitat to be cleared, in the context of more extensive, remnant Brigalow community that will be retained, is not considered critical to the survival of the ecological community.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	Within the pipeline footprint, approximately 0.8 ha of soil structure will be destroyed, associated with vegetation clearing. Surface drainage is otherwise not anticipated to be affected. It is anticipated that based on implementation of management strategies (e.g. erosion and sediment control and weed hygiene protocols) that impacts on habitat quality of the retained areas of Brigalow TEC will be avoided. It is anticipated that based on implementation of management strategies (e.g. erosion and sediment controls and management of hazardous materials) that impacts on habitat quality of retained areas will be controlled. This will include management of uncontrolled spills, and management of discharges related to the project.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	The confirmed Brigalow TEC patch that will be impacted (0.8 ha) is at the southern extent of a more extensive patch of Brigalow. With appropriate mitigation measures (weed hygiene and erosion and sediment control), it is not anticipated that a substantial change in the species composition of retained areas will occur. These patches are exposed to significant existing stressors attributed to cattle grazing and weed encroachment. However, to ensure the Brigalow communities composition and function is not impacted from threats such as hot bushfires or new weed encroachment actions such as maintaining fire breaks, controlling weeds and hygiene protocols preventing introduction and spread of weeds to site will be implemented over the life of the Project. The Project will not cause a substantial change to the composition or ecological function of Brigalow communities.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • **assisting invasive species, that are harmful to the listed ecological community, to become established** • **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological** • **community which kill or inhibit the growth of species in the ecological community.**	The confirmed Brigalow TEC patch to be cleared within the pipeline alignment (0.8 ha) is at the southern extent of a larger patch (~60 ha). The area to be impacted comprises approximately 1.3% of the patch, which is not a substantial reduction. Weeds can alter the structure and function of Brigalow ecosystems and affect their suitability as habitat for native species. Introduced grasses, such as Buffel Grass (*Cenchrus ciliaris*), Rhodes Grass (*Chloris gayana*) and Green Panic Grass (*Megathyrsus maximus*), pose the greatest threat by drawing fires into the Brigalow TEC and increasing fire severity. There is potential for the Project to facilitate the spread of these weeds through the operation of machinery, vehicles and bringing materials to site. Livestock may also spread weeds. With the implementation of hygiene protocols to minimise the risk of weed spread, and weed management to be undertaken across the Project area, it is unlikely the further establishment of these weeds across the Project area will occur. No fertilisers will be used.
Interfere with the recovery of an ecological community	The proposed clearing (0.8 ha) will interfere with the recovery of the extant patch of Brigalow TEC (approximately 60 ha) to a minor extent. No clearing of any regrowth Brigalow would assist the recovery of this patch, which has been subjected to historical clearing, weed encroachment and grazing.

Table 10.2 Significant impact assessment – Brigalow TEC (status Endangered EPBC Act)

Community profile	Brigalow (*Acacia harpophylla* dominant and co-dominant) Status: Endangered (EPBC Act)
Conclusion	Disturbance to the Brigalow TEC will be limited to approximately 0.8 ha of a more extensive, 60 ha patch. Weed hygiene protocols will be put in place to minimise the risk of project activities facilitating the spread of weeds and weed management will occur to ensure weeds do not encroach into the remaining patch of Brigalow. Erosion and sediment control measures will also ensure that the integrity of abiotic factors in retained Brigalow is maintained. Therefore, no significant impact is predicted.

10.3 Ornamental Snake

10.3.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- species profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193
- *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPaC, 2011)
- *Approved Conservation Advice for Denisonia maculata* (Ornamental Snake). (DoE 2014).

There is no Recovery Plan or Threat Abatement Plan in place for this species.

10.3.2 Ecology, habitat, distribution

Ornamental Snake suitable habitat comprises open-forests to woodlands associated with gilgai formations and wetlands (mainly associated with Queensland Regional Ecosystem Land Zone 4).

These are commonly mapped as REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9, 11.5.16 or mapped as cleared but where the above REs formerly occurred (DSEWPC 2011). The species also is found on lake margins and wetlands (DoE 2019b).

Ornamental Snake habitat is likely to be found in Brigalow, Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolibah dominated vegetation communities. However, the species is also found in grassland associated with gilgai in cleared vegetation. Although there are records from riparian areas, the species' presumed preference for riparian habitat is questionable (DAWE 2022a).

Agnew (2010) states that sites where the species is abundant have the following characteristics:

- Sites where Ornamental Snakes have been recorded in abundance share the following habitat characteristics (Agnew 2010 pers. comm):
  - They are located within the lowest part of the catchment. The Ornamental Snake has been found in greatest numbers in shallow water where some aquatic vegetation is present, or where fringing groundcover vegetation has been inundated, especially in flooded gilgai where the dominant aquatic macrophyte is Bog Hyacinth (*Monochoria cyanea*).
  - They have diversity of gilgai size and depth (if deep, then broad with gently sloping gradients at the sides).

- There are soils of high clay content and deep-cracking characteristics. Water retention capacity increases with an increase in the fine clay particle fraction of soils. This, in turn, influences certain habitat conditions that are important for the Ornamental Snake and the frog species it preys upon. Cracking clays with higher sand and more sodic cracking clays, often associated with Brigalow/Belah-dominated communities, have a lower fine clay particle fraction and are likely to have lesser water retention capacity.

- Ground timber is usually relatively common (especially piles adjacent to or close by to gilgai).

- Where burrowing frogs (*Cyclorana* species) are abundant.

- Habitat patches are typically greater than 10 ha in the area and are within, or connected, to larger areas of remnant vegetation.

The species is nocturnal, sheltering during the day under fallen timber and in soil cracks. It is likely to be active year round except the cooler months, but will seek refuge during dry periods in soil cracks (DAWE 2022a).

10.3.3 Important populations

DCCEEW considers that an occurrence of important habitat for the Ornamental Snake is a surrogate for an 'important population' of the species.

The *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC 2011) defines habitat for any one of the listed Brigalow Belt reptiles (of which Ornamental Snake is one) being considered important if it is:

- habitat where the species has been identified during a survey
- near the limit of the species' known range
- large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations)
- a habitat type where the species is identified during a survey, but which was previously thought not to support the species.

As such, the occurrence of the Ornamental Snake in the Project area constitutes important habitat, and an important population. The Draft Referral Guidelines go on to specify gilgai depressions and mounds (including connectivity between gilgai and other suitable habitat) as being known important habitat.

10.3.4 Threats to the species

A variety of factors are thought to have contributed to the species' decline including (Brigalow Belt Reptiles Workshop, 2010):

- habitat loss through clearing
- habitat fragmentation
- habitat degradation by overgrazing by stock, especially cattle, or grazing of gilgai during the wet season leading to soil compaction and degradation of soil structure
- alteration of hydrology
- alteration of water quality

- contact with Cane Toad
- predation by feral species
- invasive weeds.

10.3.5 Distribution within the Project area and habitat mapping

After heavy rain on 10 March, a total of nine individuals were recorded on Lot 23 and on the following night, a total of 30 individuals were recorded in the same area. All individuals were in the gilgai on the eastern part of the property, although it is likely individuals would have been recorded in the western part of the alignment too if this area had been accessed (was not possible due to flooding).

In November 2022, five Ornamental Snake were recorded on the southern part of Lot 11 in gilgai habitat, although the species is expected on the whole north-south alignment on this lot.

Additionally, the species has potential to occur in parts of Lot 11 and Lot 2 where Brigalow communities on clay soils are present adjacent to areas of gilgai on the east-west alignment north of the Project area. These areas are mapped as potential dispersal habitat. These areas were spot lit in November 2022 although no Ornamental Snakes were recorded in these areas. This connectivity habitat includes Brigalow communities away from areas of gilgai. This is consistent with the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DSEWPC 2011) which includes connective habitat as being important for the species.

All areas of gilgai within the Project area have been mapped as preferred habitat for this species, based on the number of records during the March 2022 survey.

10.3.6 Significant impact assessment

The MNES significant impact assessment for Ornamental Snake using the Significant Impact Guidelines (DoE 2013a) is summarised in Table 10.3.

Table 10.3 Significant impact assessment – Ornamental Snake (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Lead to a long-term decrease in size of an important population.	As per Section 10.3.3 the occurrence of the Ornamental Snake in the Project area constitutes an important population. The *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC 2011) go on to specify gilgai depressions and mounds (including connectivity between gilgai and other suitable habitat) as being known important habitat. There are extensive areas of gilgai in the Project footprint – the majority of the alignment on Lot 23 is located in areas of landzone 4 on heavy clay soils with well formed gilgai. Toward the western end of the alignment, gilgai are dominated by Buffel Grass with little fallen timber, but these areas nonetheless are likely to contain the species. After heavy rain on 10 March, a total of nine individuals were recorded on Lot 23 and on the following night, a total of 30 individuals were recorded in the same area. All individuals were in the gilgai on the eastern part of the property, although it is likely individuals would have been recorded in the western part of the alignment too if this area had been accessed (was not possible due to flooding). Additionally, the species is considered very likely to occur in the north-south alignment on Lot 11, where gilgai habitat is virtually identical to the areas surveyed and found to contain high numbers of Ornamental Snake on Lot 23. Targeted surveys (e.g. spotlighting) are not considered necessary to demonstrate this. Parts of Lot 2 where Brigalow communities on clay soils are present adjacent to extensive areas of gilgai, but there are very limited areas with soil cracks or gilgais in the Project area itself. These areas are mapped as potential dispersal habitat. This dispersal habitat is present at the eastern end of the pipeline alignment on Lot 2, and within the proposed compressor facility location. Within the Project footprint, there is 36.05 ha of preferred habitat and 19.62 ha of connectivity/dispersal habitat between areas of preferred habitat) mapped in the Project footprint.
	The Project will result in a relatively narrow clearance footprint (30 m) through the species' habitat, except in the compressor facility location where the footprint will measure 200 m x 300 m. Impacts are likely to the species during construction through earthworks resulting in mortality of individuals. Mitigation measures around preclearance surveys will be implemented, including: • Spotlighting pre-clearance surveys will occur in mapped areas of Ornamental Snake preferred habitat immediately (the night before) prior to vegetation and topsoil clearing taking place in the summer months (September to March inclusive). If any individuals are caught they will be released in adjacent suitable habitats which are being retained outside of the Project area away from clearing. • During clearing within mapped Ornamental Snake habitat, a fauna spotter catcher will supervise any ground vegetation clearance and earthworks due to the likelihood they could be residing in soil cracks. This will be as part of general fauna spotter activity associated with the SMP for the Project. If any individuals are caught they will be released that night to adjacent suitable habitats which are being retained outside of the Project area. There is potential for individuals to be trapped in the trench during trenching activities. Fauna spotter catchers will check the open trench daily and remove trapped individuals. During operation the pipeline easement will be rehabilitated so will be available for utilisation again by the species. However, it is anticipated that rehabilitation will use existing tracks. will involve construction of an access track, and the structure of gilgai (melon holes and mounds) will be destroyed, along with cracks in the soil structure. Whilst Ornamental Snake could still traverse these areas, the lack of soil cracks will place them at greater risk of predation. Given the evidently high density of Ornamental Snake in the Project area, and limited loss of preferred and connectivity habitat, it is unlikely the action will result in a long term decrease in the size of the important population, which is likely to be small in the context of the local population.

Table 10.3 Significant impact assessment – Ornamental Snake (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Reduce the area of occupancy of an important population.	The occurrence of Ornamental Snake in the Project area constitutes an important population as per the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC 2011). The clearance of 36.05 ha of preferred habitat – some of which represents farm tracks and firebreaks and 19.62 ha of connectivity/dispersal habitat will likely lead to a localised decrease in the area of occupancy of the local population, but due to the amount of available habitat surrounding the Project footprint and in the region and the extensive number of individuals recorded both by EMM during surveys for this Project and other database records in the vicinity, it is unlikely that this decrease would be significant at a regional scale. Rehabilitation of these areas will also reduce the impact.
Fragment an existing important population into two or more populations.	The Project is unlikely to fragment an important population of Ornamental Snake in the longer term (operational phase), although in the shorter term (construction phase) will likely prevent movement of individuals through the Project area. The alignment on Lot 23 and Lot 11 will involve the clearing of 55.68 ha of habitat. Extensive areas of habitat are retained surrounding this area. The habitat is already fragmented to some degree by constructed farm access tracks, existing easements and fence lines and as such the additional pipeline easement is not anticipated to significantly further fragment the habitat. Additionally on Lot 2, the construction of the easement through mapped dispersal/connectivity habitat will not negate the ability of the species to traverse this area between more suitable areas of gilgai habitat, except through the compressor facility where the disturbance will be at a scale unlikely to be overcome by dispersing snakes. During operation the pipeline easement will be rehabilitated so will be available for utilisation again by the species. However, it is anticipated that rehabilitation will use existing tracks. will involve construction of an access track, and the structure of gilgai (melon holes and mounds) will be destroyed, along with cracks in the soil structure. Whilst Ornamental Snake could still traverse these areas, the lack of soil cracks will place them at greater risk of predation. Rehabilitation is outlined in Appendix L in further detail.

Table 10.3 Significant impact assessment – Ornamental Snake (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival of the Ornamental Snake is not defined, however the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC 2011) defines important habitat as being gilgai depressions and mounds, with habitat connectivity between gilgai noted as important also. Habitat critical to the survival of a species or ecological community is defined by DoE (2013) to be areas that are necessary: • for activities such as foraging, breeding, roosting, or dispersal • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long term evolutionary development • for the reintroduction of populations or recovery of the species or ecological community. The species is widespread in the region, and not at the limit of the species range. Regardless, large areas of important habitat (as demonstrated by numerous Ornamental Snake records) are located in the wider locality. As such the habitat is likely to constitute habitat critical to the survival of the species. Additional to the direct albeit temporary impacts described above and under earlier criteria, there is potential for indirect impacts to retained Ornamental Snake habitat may occur through abiotic factors such as surface water, groundwater or soil impacts. Based on mitigation measures described in Chapter 9, impacts from sediment runoff or alteration to flows from the Project are unlikely to have a significant impact on areas of gilgai that may support this species. It is anticipated that based on implementation of management strategies (e.g. erosion and sediment controls and management of hazardous materials) that impacts on habitat quality of retained areas will be controlled. This will include management of uncontrolled spills, and management of discharges related to the project. Additional to this, progressive rehabilitation of landforms will assist in potential for sediment transport. Increased dust from excavation, vehicle movement and construction activities has the potential to adversely impact the health of retained vegetation in the Project area, including areas of gilgai habitat. Any degradation in quality of vegetation in these areas may compromise the availability of refugia for this species. As such the Project has the potential to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	The Ornamental Snake is a viviparous species which usually births 6 or 7 live young (DAWE, 2020). It is unlikely that the Project will disrupt the breeding cycle of an important population of this species. The majority of habitat for this species in the study area is avoided, with only 55.68 ha cleared, some of which includes existing firebreaks, access track and fencelines.

Table 10.3 Significant impact assessment – Ornamental Snake (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Project footprint will result in the loss of 36.05 ha of preferred habitat associated with well-formed gilgai and 19.62 ha of connectivity/dispersal habitat, which acts as connectivity habitat between areas of preferred habitat. Although gilgai habitat is not present in these areas, the species could move through vegetation in these areas between gilgai patches. This is consistent with the *Draft Referral Guidelines for nationally listed Brigalow Belt reptiles* as stated in Section 10.3.3. Large areas of preferred habitat are retained surrounding the Project area. Additional to the direct impacts described above and under earlier criteria, there is potential for indirect impacts to retained Ornamental Snake habitat may occur through abiotic factors such as surface water, groundwater or soil. Although areas of retained habitat in gilgai are away from any clearing the potential for indirect impacts to occur is present. These are described under Criteria 4 above. Preferred habitat for this species is mapped within areas of grazing land already subject to existing threats to the species including weed infestation, grazing, presence of introduced fauna species (such as Cane Toads) and habitat fragmentation. While the Project will result in a small loss of preferred or connectivity/dispersal Ornamental Snake habitat it is not expected to an extent that will cause the species population to decline, due to the large areas of available retained habitat and rehabilitation of the impacted areas.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The presence of the Cane Toad is known to adversely impact populations and individuals of the Ornamental Snake. It is unlikely that the Project will lead to an increase in the number of Cane Toads present on the site. This species is well established in the area and weed and pest hygiene protocols will be followed. The potential for weeds to further impact on the quality of foraging habitat is low. The Project area is already subject to weed invasion and impacts from grazing practices. Gilgai are often infested with Buffel Grass. Weed and pest control measures as outlined in Chapter 9 will be in place to minimise the risk of Project activities further facilitating the spread of weeds and pests across the landscape.
Introduce disease that may cause the species to decline.	Disease is not recognised as a threat to the Ornamental Snake. Given this, it is unlikely that the Project will introduce diseases that cause the species to decline.

Table 10.3 Significant impact assessment – Ornamental Snake (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Interfere substantially with the recovery of the species.	No adopted or made Recovery Plans are available for this species. The Project activities do not interfere with the overall objectives of the *Draft Recovery Plan for the Queensland Brigalow Belt Reptiles* (Richardson 2006). With mitigation of potential project impacts, and retention of areas of higher quality habitat where the species was observed in Project surveys, any impacts, are unlikely to interfere with the recovery of the species. The Action Plan for Australian Reptiles (Cogger et al. 1993) lists the following recovery actions: • identify suitable habitat for conservation of the ornamental snake • identify key threats and develop management guidelines to protect key habitat • ensure ornamental snake conservation is incorporated into appropriate land management decisions • maximise the establishment of appropriate reserves to protect ornamental snake habitat and landscape connectivity over the long term, e.g. on stock route networks, road reserves and private lands • implement recommended fire management guidelines in property and reserve designs • work with landholders and key stakeholders to undertake monitoring programs on selected sites • maximise ornamental snake habitat and landscape connectivity • ensure ornamental snake conservation is incorporated into appropriate land management decisions. The Project will not significantly interfere with these objectives.
Conclusion	As per the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC 2011), clearing between 1–2 ha of important habitat constitutes a high risk of a significant residual impact. Due to the large number of Ornamental Snakes recorded, and the presence of areas of mapped important habitat, the clearing of 36.05 ha of preferred habitat and 19.62 ha of suitable/connectivity habitat therefore is likely to constitute a significant residual impact to the species.

10.4 Squatter Pigeon

10.4.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- species profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440
- Conservation Advice *Geophaps scripta scripta* squatter pigeon (southern) (TSSC 2015a)
- Survey Guidelines for Australia's Threatened Birds (DEWHA 2010b).

There is no Listing Advice or adopted or made Recovery Plan in place for this species. The following Threat Abatement Plans are relevant to this species:

- threat abatement plan for predation by feral cats (DoE 2015b)
- threat abatement plan for competition and land degradation by rabbits (DoE 2016)

- threat abatement plan for predation by the European red fox (DoE 2008b).

10.4.2 Ecology, habitat, distribution

Squatter Pigeon can utilise a broad range of habitats including remnant, regrowth, non-remnant, and modified vegetation communities with nearby access to permanent surface water (typically within 1–3 km). Generally, they are recorded in open *Eucalyptus, Corymbia, Acacia* or *Callitris* dominated communities, and occur in their highest densities in those with abundant and diverse native grasses (primary foraging resource). Utilised habitat in these areas have low ground layer cover, typically below 33%. Soils in these areas consist of sandy substrates dissected with low gravely ridges (DAWE 2022b).

The species also shows soil and landscape associations with foraging and breeding primarily recorded from flat alluvial plains, gently sloping and undulating plains, as well as low hilly terrain with well-drained, sandy, or loamy soils. Breeding in these areas only generally occurs within 1 km of a permanent water source (artificial or natural) (Squatter Pigeon Workshop 2011). The species is frequently observed around disturbed areas such as access tracks and cattle yards.

Soil landscapes are good indicators of where natural, foraging and breeding habitats for the Squatter Pigeon occur (Squatter Pigeon Workshop 2011). Well-draining, gravelly, sandy or loamy soils support the open-forest to woodland communities with patchy, tussock-grassy understories that support the subspecies' foraging and breeding requirements. Given that the subspecies nests in shallow depressions in the ground, it requires well-draining soils. The species' foraging and breeding habitats are known to be associated with land zones 3, 5 and 7 of which only land zone 3 occurs in the Project area.

Squatter Pigeons can breed throughout most of the year if conditions are good, however, optimal conditions for breeding success are likely to be regulated by the abundance of food resources. The generation length is estimated to be five years. Squatter Pigeons usually breed in solitary pairs and pairs may produce two broods of young per season (DAWE 2022b).

The Squatter Pigeon is a medium-sized, highly terrestrial pigeon that occurs from Cape York to southern Queensland (formally to northern New South Wales) (DAWE 2022b). The distribution of the southern subspecies overlaps with the distribution of the northern subspecies, *Geophaps scripta peninsulae*. The intergrade zone extends from the Delta Downs area of south-western Cape York, east to Chillagoe, south-east to Halifax Bay and along the east coast to just north of Mackay, and west to Hughenden (DAWE 2022b).

10.4.3 Important populations

Important populations have been identified (Squatter Pigeon Workshop 2011) as being small, isolated and sparsely distributed populations occurring south of the Carnarvon ranges in central Queensland. This includes:

- populations occurring in the Condamine River catchment and Darling Downs of southern Queensland
- the populations known to occur in the Warwick-Inglewood-Texas region of southern Queensland
- any populations potentially occurring in northern NSW.

North of the Carnarvon Ranges the species is relatively common and is considered to be distributed as a single, continuous sub-population (Squatter Pigeon Workshop 2011). As such, the population in the Project area is not considered to be an important population.

10.4.4 Threats to the species

The main threats to species relate to the loss and fragmentation of habitat due to clearing for agricultural purposes (including degradation of habitat through overgrazing). Degradation of habitat from invasive weeds, such as Buffel Grass which has been widely introduced as an improved pasture species, is also a key threat (DAWE 2022b).

Predation by feral predators such as cats and foxes are another threat to the species.

No recovery or threat abatement plans are in place for this species. The Commonwealth's Approved Conservation Advice for Squatter Pigeon (southern) (TSSC 2015a) lists the following priority conservation actions:

- Protect and rehabilitate areas of vegetation that support important sub-populations.
- Protect sub-populations of the listed subspecies through the development of covenants, conservation agreements or inclusion in reserve tenure.
- Develop and implement a stock management plan for key sites.
- Raise awareness of the squatter pigeon (southern) within the local community, particularly among land managers.

10.4.5 Distribution within the Project area and habitat mapping

Squatter Pigeons were observed on four different occasions while traversing the Project area in March 2022. This comprised groups of one, two, five and eight individuals all in the same vicinity around the dam on Lot 23.

Squatter Pigeons are typically found in remnant or regrowth habitats dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species within 3 km of available surface water (DAWE 2022b). Breeding habitat is within 1 km of a water source (DAWE 2022b). Permanent or temporary water is available across the Project area in the form of the above named farm dam, as well as other small dams in the vicinity of the Project area. Additionally, mildly-disturbed or cleared habitats along vehicle tracks or on the peripheries of the Project area represent ideal habitat for this species.

Utilised habitat in these areas have low ground layer cover, typically below 33%. Given that the majority of the Project area is characterised by brigalow regrowth with a dense grassy understorey of Buffel Grass, with limited availability of permanent water, the alignment generally does not provide suitable habitat for Squatter Pigeon.

Suitable habitat is associated with the open woodland adjacent to the farm dam and similar habitats away from the alignment.

Habitat mapping is discussed in Section 7.6. It is based on DCCEEW criteria, but was further refined based on observations made in the field as much of the Project area is considered too weedy and densely vegetated for the species to occur (e.g. areas of dense Buffel Grass) or areas on heavy clay soils (landzone 4). Particularly within areas of Project infrastructure in the centre of the Project area, the habitat is typically unsuitable for the species. Much of the Project area is dominated by areas of dense Buffel Grass groundcover, which differs from the patchy tussock grassy understories of open woodland favoured by the species. Feeding opportunities are restricted in such dense weedy understoreys, and the potential for predation is increased. Therefore, dense Buffel Grass areas have been excluded from mapping.

10.4.6 Significant impact assessment

The MNES significant impact assessment for Squatter Pigeon using the Significant Impact Guidelines (DoE 2013a) is summarised below in Table 10.4.

Table 10.4 Significant impact assessment – Squatter Pigeon (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Lead to a long-term decrease in size of an important population.	North of the Carnarvon Ranges the species is relatively common and is considered to be distributed as a single, continuous sub-population (Squatter Pigeon Workshop, 2011). As such, the population in the Project area is not considered to be an important population. Squatter Pigeons were observed on four different occasions while traversing the Project area in March 2022, and once in June 2022. This comprised groups of one, two, five and eight individuals all in the same vicinity around a farm dam surrounded by open grassy woodland on Lot 23 during March 2022. A group of four birds were seen in the same area in June 2022. It is expected that individuals disturbed by construction activities will temporarily move away from the area of disturbance into areas of retained habitat bordering the Project area. Retained habitat will offer refuge for the species and extensive areas of grassy woodland and open grassland occurs surrounding the alignment. Connectivity to these areas will be maintained. Connectivity will be maintained to the dam, where the species was recorded, which is bordered by grassy woodland to the south. The majority of the Project area on Lot 23 and the southern portion of Lot 11 is unsuitable for the species, being dominated by dense Buffel Grass. Additionally, the Project area on Lot 23 and the southern part of Lot 11 is dominated by clay soils, and sandy substrates are not extensive. The habitat is typically unsuitable for the species due to a combination of factors, namely: • Terrain and soils – most of the Project area on Lot 23 and the southern part of Lot 11 occurs on clay dominated soils, which differs from the flat alluvial plains and sandy substrates favoured by the species (Squatter Pigeon Workshop, 2011). • Groundcover – much of the Project footprint is dominated by areas of dense grassy groundcover, which differs from the patchy tussock grassy understories of open woodland favoured by the species. Feeding opportunities are restricted in such dense grassy understoreys, and the potential for predation is increased. • Vegetation communities – the species favours open grassy woodlands and disturbed area. The Project area on Lot 23 and the southern part of Lot 11 is dominated by extensive Buffel Grass and communities along creek lines are dense with clay soils. Although the species was initially considered to have potential to occur in the Project area on Lot 23 and the southern part of Lot 11 (especially near water sources) the likelihood is significantly reduced by the dominance of Buffel Grass (*Cenchrus ciliaris*) and clay soils (this species favours sandy soils and a mosaic of open woodland and native grasses). The majority of the Project area on Lot 23 and the southern part of Lot 11 comprises extensive areas of dense Buffel Grass cover and clay soils. This species generally requires open forest or scrub on sandy soils, dominated by native grasses, in close association with permanent water (DoE 2019a). Where non-alluvial clay soils (land zone 4) occur, the species is less likely to be present unless the ground cover has been thinned to suitable levels (Squatter Pigeon Workshop 2011); DoE 2019a. On the northern part of Lot 11 and Lot 2, open woodlands on sandy soils provide habitat for the species although it was not observed during the June–July 2022 surveys in that area. The Project is unlikely to lead to a long-term decrease in an important population.

Table 10.4 Significant impact assessment – Squatter Pigeon (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Reduce the area of occupancy of an important population.	North of the Carnarvon Ranges the species is relatively common and is considered to be distributed as a single, continuous sub-population (Squatter Pigeon Workshop, 2011). As such, the population in the Project area is not considered to be an important population. No important population is present in the Project area. Database records indicate the species occurs widely across the local and wider region. Clearing for the Project is expected to remove up to 31.67 ha of habitat for the species (see Section 8.2). The Project will reduce the area of occupancy in the local area to a very minor extent. Preferred habitats are located within wooded portions of the Project area which support more suitable foraging conditions. It is expected that individuals disturbed by construction activities will temporarily move away from the area of disturbance into areas of retained habitat bordering the Project area in the vicinity of this dam, which is bordered by grassy woodland to the south. Connectivity to this area will be maintained.
Fragment an existing important population into two or more populations.	North of the Carnarvon Ranges the species is relatively common and is considered to be distributed as a single, continuous sub-population (Squatter Pigeon Workshop, 2011). As such, the population in the Project area is not considered to be an important population. There is no important population in the study area or Project area. The species is sparsely distributed across a wide range. Clearing for the Project is expected to remove up to 31.67 ha of habitat for the species. Roads, access tracks and the pipeline are unlikely to cause fragmentation of the local population. The species regularly forages alongside and on access tracks, and in other disturbed habitats. Access tracks throughout the site will have strict speed limits in place. The impact on movement across the Project area will be negligible. The Project area is already heavily fragmented as a result of historical and contemporary clearing for agriculture, predominantly in form of cattle grazing. The Project design will maintain linkages to surrounding retained habitat. Vegetation clearance will not impede the movement of any Squatter Pigeon present in the Project area. The Project is unlikely to fragment an existing important population.

Table 10.4 Significant impact assessment – Squatter Pigeon (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Adversely affect habitat critical to the survival of a species.	No critical habitat for the species is defined. The species occurs in grassy woodlands which remain abundant across much of its range including the Project area. Squatter Pigeon also occur in disturbed areas cleared for cattle grazing and along access tracks. It is not considered that the Project area supports habitat critical to the survival of the species. Significant areas of habitat will be retained surrounding the Project area and access to water points such as farm dams will be maintained. *The Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (DoE 2013)* state that critical habitat can include "areas that are necessary for activities such as foraging, breeding, roosting, or dispersal" (DoE 2013). Although forming potential breeding habitat due to the proximity of water sources, the nature of the alignment means that Squatter Pigeon are unlikely to use the Project area for breeding preferentially over more suitable habitat in the surrounding woodlands which offers more shelter. The limited nature of clearing in terms of width means that habitat is unlikely to be adversely affected, and once constructed the pipeline will be rehabilitated and able to be utilised by this species (see Appendix L). Noting the other definitions of critical habitat (DoE 2013), specifically areas that are necessary: • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • for the reintroduction of populations or recovery of the species or ecological community. It is unlikely that the survey area meets these criteria. The ability of the Project area to support this species will be maintained. As such the Project is not expected to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	North of the Carnarvon Ranges the species is relatively common and is considered to be distributed as a single, continuous sub-population (Squatter Pigeon Workshop, 2011). As such, the population in the Project area is not considered to be an important population. There is no important population in the study area or Project area. Large areas of potential breeding habitat will be retained throughout the Project area. Pre-clearance surveys will identify breeding places for this species, and should breeding sites be encountered, an exclusion zone will be placed around the nest until young have fledged consistent with the requirements of an approved Species Management Program under which the fauna spotter catcher(s) will be working.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The species occurs in grassy woodlands which remain abundant across much of its range including the Project area. Squatter Pigeon also occur in disturbed areas cleared for cattle grazing and along access tracks. Preferred habitats are located within wooded portions of the Project area which support more suitable foraging conditions. Large parts of the Project area in which the majority of Project infrastructure is located is dominated by dense Buffel Grass cover and is unsuitable habitat for the species. Significant areas of habitat will be retained within the Project area. It is unlikely that the Project will modify the species habitat.

Table 10.4 Significant impact assessment – Squatter Pigeon (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Degradation of habitat from invasive weeds and predation by feral predators such as cats and foxes are threats to the species. The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials being bought in from outside the Project area although the Project area is already subject to extensive weed and pest impacts. Weed and pest control measures as outlined in Section 9.9 will be in place to minimise the risk of Project activities further facilitating the spread of weeds and pests across the landscape.
Introduce disease that may cause the species to decline.	Disease is not a known threat to the species, and it is unlikely that the Project will introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	There is no State or Commonwealth recovery plan for this species. The Approved Conservation Advice for Squatter Pigeon (TSSC 2015a) outlines the main threats to species as relating to the loss and fragmentation of habitat due to clearing for agricultural purposes (including degradation of habitat through overgrazing). Degradation of habitat from invasive weeds, such as Buffel Grass (*Cenchrus ciliaris*) which has been widely introduced as an improved pasture species, is also a key threat. Weed and pest control measures as outlined in Section 9.9 will be in place to minimise the risk of Project activities further facilitating the spread of weeds and pests across the landscape. The long term survival and recovery of the species depends on (Squatter Pigeon Workshop, 2011): • the protection of habitat critical to the survival of the subspecies throughout its range • the restoration of habitat which is potentially critical to the survival of the subspecies, especially in northern NSW and southern Queensland where there is a greater threat of a further contraction in the subspecies' range • the alleviation of mortality caused by predators, particularly cats and foxes • the development of a greater understanding of the subspecies' ecology and use of modified landscapes for foraging, breeding and dispersal. The Project will not conflict with any of these objectives.
Conclusion	Based on an evaluation of all criteria, the Project is not expected to have a significant residual impact on Squatter Pigeon. The Project will result in the loss of up to 9.55 ha of breeding habitat, 19.98 ha of foraging habitat and 2.15 ha of dispersal habitat (though no important populations are present on site).

10.5 Koala

Although the likelihood of Koala occurring on the Project area was assessed as potential (not likely), conservatively a significant residual impact assessment has been prepared. DCCEEW has identified this species as being on a high priority list due to the extensive bushfires which occurred in 2019–2020 in southern and eastern Australia and although they are not considered likely to occur on site, and have not been recorded to date, assessments have been carried out based on their potential presence.

10.5.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- Species profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=85104.
- EPBC Referral Guidelines for the vulnerable Koala (DoE 2014) – current at time of commencement.
- Approved Conservation Advice for *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Koala Northern Designatable Unit) (TSSC 2012b).
- Commonwealth Listing Advice for *Phascolarctos cinereus* (Koala) (TSSC 2012c).
- Adams-Hosking, C, Grantham, H, Rhodes, J, McAlpine, C, & Moss, P (2011). Modelling climate-change-induced shifts in the distribution of the koala. *Wildlife Research* 38, 122–130.
- Identifying habitat for the endangered Koala – DCCEEW (2022).
- A review of koala habitat assessment criteria and methods (Australian National University 2021).

There is no Recovery Plan or Threat Abatement Plan in place for this species.

No formal Queensland or Federal survey guidelines exist for Koala, although survey effort principles within the EPBC Referral Guidelines (current at time of assessment commencing) for the vulnerable Koala were referenced. These are consistent with those referred to in "A review of koala habitat assessment criteria and methods" (Australian National University 2021).

10.5.2 Ecology, habitat, distribution

Koala food trees typically consist of species from *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Melaleuca* genera. Conservatively, any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees is considered potential Koala habitat.

During the breeding season, males will attempt to establish dominance over the home ranges of a number of females, and on average, male Koalas usually have larger home ranges than females (DAWE 2022f).

Female Koalas can potentially produce one offspring each year, with births occurring between October and May. Young Koalas are independent from about 12 months of age. The generation length of Koalas has been estimated at 6 years however, longevity in the wild is more than 15 years for females and more than 12 years for males (DAWE 2022f).

Koalas occur throughout north-east, central and southeast Queensland, extending south through Victoria into South Australia. The density of Koalas is generally denser towards the coast (DAWE 2022f).

Home range sizes are variable, with those in poorer habitats being larger than in higher quality habitats. Home ranges overlap although the species is generally solitary. Koalas generally move little under most conditions, however longer movements through dispersing individuals (mostly young males) are recorded, with movements of several kilometres over land with little vegetation reported (DAWE 2022f).

Adams-Hosking et al. (2011) predicts that future Koala distributions will be directly affected by global warming due to limiting availability of food trees. It is proposed that climatically suitable habitat, such as cooler regions and mountainous areas, be conserved adequately as future climate refugia to allow assisted relocations of Koalas if current habitat areas become hotter and drier (Adams-Hosking et al. 2011).

10.5.3 Threats to the species

The main threats to the Koala are ongoing habitat loss and habitat fragmentation (DAWE 2022f). Other factors include (DAWE 2022f):

- deaths from dog (feral and domestic) attacks
- deaths from vehicle collisions
- diseases including Chlamydia strains and Koala Retrovirus
- the effects of climate change and droughts.

No recovery or threat abatement plans are in place for this species. The Commonwealth's *Approved Conservation Advice for Koala* (TSSC 2012b) lists the following priority conservation actions:

- develop a planning protocol to be used in areas of Koala populations to prevent loss of important habitat
- monitor progress of recovery actions
- identify high conservation priority populations.

10.5.4 Distribution within the Project area and habitat mapping

This species has not been recorded within the Project area or within the study area. It is generally scarce in the Moranbah region.

Conservatively it is considered as having potential to occur on the Project area despite there being no evidence of scratches or scats during field surveys. Habitat mapping for the species is defined in Section 7.6.6 and is limited to vegetation where food tree species are present. The Project area is largely cleared and dominated by dense weedy ground-cover.

If present, the species is likely to be restricted to areas where sparse *Eucalyptus cambageana* or *Eucalyptus orgadophila* are present, or the patch of RE 11.5.3/11.5.15 on Lot 11. The remainder of the Project area is largely cleared and dominated by regrowth Acacia. These areas were subject to intensive spotlighting in November 2022 and the species was not recorded.

As per DCCEEW guidance (Australian National University 2021) cleared areas and acacia regrowth is considered to have the potential to support dispersal of the species between areas of habitat. All other areas of the Project area therefore are considered to be potential dispersal habitat although the frequency of this mechanism is likely to be low given the low potential for the species to occur on a regular basis.

For the purposes of this assessment, all Koala habitat is combined and assessed. However, the different quality of Koala habitats throughout the Project area have informed Project design and layout (see Chapter 4) with higher quality areas prioritised for avoidance or minimisation of infrastructure.

Approximately 5.0 ha of low quality potential habitat is mapped within the Project disturbance footprint and 60.05 ha of areas that Koala may potentially move through during dispersal, although given their likely scarcity in the Project area this is likely to be very infrequent.

10.5.5 Significant impact assessment

The MNES significant impact assessment for Koala using the Significant Impact Guidelines (DoE 2013a) is summarised below in Table 10.5.

Table 10.5 Significant impact assessment – Koala (status Endangered EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	Response
Lead to a long-term decrease in size of a population.	No individual Koala have been recorded in the Project area or within the surrounding study area. Indirect evidence (scat and scratches) was not recorded. The quality of habitat varies within the Project area. For example, large parts of the Project area are cleared areas and unsuitable for the species beyond the occasional individual traversing areas of cleared ground or unsuitable acacia regrowth. Despite there being no records of the species on the Project area or the study area and no signs of the species recorded in field surveys, conservatively an assessment on this species is carried out. The Project footprint will result in the loss of 5.0 ha of low quality potential habitat. The majority of higher quality habitat associated with preferred foraging resources such as E.orgadophila or E.cambageana woodland is avoided. If it occurs, it is likely to be restricted to areas where sparse Eucalyptus cambageana are present, or the patch of RE 11.5.3/11.5.15 on Lot 11 or a patch of Eucalyptus orgadophila open grassy woodland on Lot 2. However, this habitat is marginal. The remainder of the Project area is largely cleared and dominated by regrowth Acacia. The planned sequential clearing of habitat in any mapped remnant woodland to be cleared will provide any Koalas present the opportunity to safely move into adjacent habitats. A sequential clearing protocol where fauna spotter-catchers are present during clearing will ensure Koalas are not harmed during clearing and there are safe movement opportunities. This sequential clearing protocol is summarised below: • Any clearing would take place in a way to allow Koalas (if present) to move into adjacent areas of retained vegetation. This will include setting clearing limits per day and allowing escape paths to retained vegetation to be maintained. If Koalas are encountered they are to be left in-situ, works stop in the area, and wait for the animal to move to retained habitat. This will entail: – Leaving a 30 m buffer of vegetation around the tree in which the Koala is located and a corridor of vegetation to retained habitat. – Monitoring the Koala location and if the animal appears stressed. – Allowing the Koala to relocate without assistance unless the animal is in immediate danger or is injured. As a result of this there is no significant residual impact to areas of potential Koala habitat (in the form of Eucalypt woodland in the Project area). The project is unlikely to impact upon the dispersal capacity of the species through areas of Acacia regrowth or cleared areas. As per DCCEEW guidance (Australian National University 2021) cleared areas and acacia regrowth is considered to have the potential to support dispersal of the species between areas of habitat. The pipeline easement will continue to support this function therefore there is no significant residual impact to dispersal habitat. Indirect impacts may occur to Koalas from the Project as a result of noise and lighting associated with construction activities. Additionally, by opening up further areas of habitat there is the potential for an increase in weeds and pest animals to infiltrate adjacent bushland although the Project area is already subject to extensive weed infestation and pest fauna presence. Due to the low likelihood of Koala being present, and as a result of the large areas of potential Koala habitat to be retained, mitigation measures to be put in place (including staging of clearing), the Project is not expected to result in a long-term decrease in the size of a population.

Table 10.5 Significant impact assessment – Koala (status Endangered EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	Response
Reduce the area of occupancy of the species.	No Koalas have been recorded in the Project area or within the surrounding study area. Indirect evidence (scat and scratches) which provide characteristic evidence of presence, was not recorded during field survey. The species has the potential to utilise eucalypt woodlands within the Project area although any presence is likely to be sporadic and infrequent. The Project footprint will result in the loss of 5 ha of potential habitat as defined in Section 7.6.6. Due to the low likelihood of the species being present, avoidance of areas of habitat which offer a higher potential of Koala being present) and through mitigation measures to be put in place, including staging of clearing, the Project is not expected to reduce the area of occupancy of the species.
Fragment an existing population into two or more populations.	It is recognised that roads and development are fragmenting Koala habitats and increasing threats to Koala populations. Threats are coming from habitat loss and fragmentation, vehicle strike, dog attack, and increased stress on populations which then increases chance of disease. The Project area is already heavily fragmented as a result of historical and more contemporary clearing for agriculture, predominantly grazing. The project is unlikely to impact upon the dispersal capacity of the species through areas of Acacia regrowth or cleared areas. As per DCCEEW guidance (Australian National University 2021) cleared areas and acacia regrowth is considered to have the potential to support dispersal of the species between areas of habitat. The pipeline easement will continue to support this function. Vegetation clearance will not impede the movement of any Koalas present in the study area. The Project area is largely cleared with a dense ground layer of Buffel Grass which would impede existing movements of the species. The ability of the Project area and immediate surrounding area to offer breeding opportunities dispersal function and genetic diversity will be maintained.
Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival of the Koala consists of forests and woodlands dominated by eucalypt species (Cork et al. 1983). Large areas of eucalypt woodlands are being retained on the boundaries of the Project area adjacent to higher quality habitat present in the riparian corridors. These retained areas will be managed to maintain habitat quality and reduce threats including weed management, pest animal control (including Wild Dogs) and fire management. The majority of habitat in the Project area has low potential to be utilised by Koalas being dominated by Acacia regrowth. The Project footprint will result in the loss of 5 ha of potential habitat as defined in Section 7.6.6. If it occurs, it is likely to be restricted to areas where sparse Eucalyptus cambageana are present, or the patch of RE 11.5.3/11.5.15 on Lot 11 or a patch of Eucalyptus orgadophila open grassy woodland on Lot 2. However, this habitat is marginal. The remainder of the Project area is largely cleared and dominated by regrowth Acacia. As such the Project is unlikely to adversely affect habitat critical to the survival of the species.

Table 10.5 Significant impact assessment – Koala (status Endangered EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	Response
Disrupt the breeding cycle of a population.	Female Koalas can potentially produce one offspring each year, with births occurring between October and May. Project activities are not expected to disrupt the breeding cycle of an important population. Areas of habitat will be retained in the Project area and immediate surrounds, including areas of higher quality potential habitat in riparian areas, and movement corridors will be retained. Fauna spotter-catchers will be present to identify if Koalas are present during the clearing process and ensure they are not harmed during as works progress (e.g. through felling of trees or movement of machinery). If a Koala is observed, the tree in which it is located, and adjacent trees will not be cleared to ensure the animal is not harmed and permitted to move from the area of its own accord, before clearing in that area can recommence. Clearing will be in accordance with an approved sequential clearing protocol to be detailed in a Species Management Plan and summarised under Criteria 1 above. It is unlikely that the Project will further impact on connectivity for the species and disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The Project footprint will result in the loss of 5.0 ha of potential habitat as defined in Section 7.6.6. If it occurs, it is likely to be restricted to areas where sparse Eucalyptus cambageana are present, or the patch of RE 11.5.3/11.5.15 on Lot 11 or a patch of Eucalyptus orgadophila open grassy woodland on Lot 2. However, this habitat is marginal. The remainder of the Project area is largely cleared and dominated by regrowth Acacia. Indirect impacts may occur to Koalas from the Project as a result of noise associated with construction activities, and by opening up further areas an increase in weeds and pest animals to adjacent bushland. While the Project will result in a minor loss of low-quality Koala habitat it is not expected to an extent that will cause the species population to decline, due to the apparent low utilisation of the study area and large areas of available retained habitat.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat.	The Project through clearing of vegetation, has the potential to increase light and open up areas which may then increase weed invasion and numbers of pest animals to adjacent retained areas of potential habitat. Feral animals such as Wild Dog prey on Koalas. This may increase in cleared areas as the hunting of Wild Dogs may become more efficient in these areas. However, the Project area is already subject to extensive weed infestation and pest fauna presence. Hygiene protocols in the operational areas will be implemented to reduce any weeds or disease being introduced to the site or spread from the site. Active pest management will also reduce the risk from Wild Dogs. Based on implementing the proposed mitigation measures it is not expected the Project will result in an increase of invasive species in the species habitat.

Table 10.5 Significant impact assessment – Koala (status Endangered EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	Response
Introduce disease that may cause the species to decline.	The most well-known disease present in the Koala population is associated with particular strains of Chlamydia. Koala Retrovirus was recently identified and is thought to be responsible for a range of conditions, including leukaemia and an immunodeficiency syndrome (DoE 2014). The Project is not likely to directly result in an increase in Chlamydia in Koalas. This is a broader issue for the population. But through a cumulative loss of Koala habitat and increase in stress on animals from dog attacks and fragmentation of habitat etc the number of Koalas contracting Chlamydia are increasing. Fauna spotter-catchers will be present during clearing to identify Koalas and ensure they are not harmed during clearing process or as works progress (e.g. movement of machinery). If a Koala is observed the tree in which it is located, and adjacent trees will not be cleared to ensure the animal is not harmed and permitted to move from the area of its own accord. Clearing will be in accordance with an approved sequential clearing protocol to be detailed in a Species Management Plan. Additionally, animals showing signs of stress or disease will be transported to a vet for treatment. The Project is unlikely to introduce a disease that may cause the species to decline.
Interfere with the recovery of the species.	DoE (2014) identifies a number of recovery and conservation objectives through Commonwealth Conservation Advice. These are listed below: • Develop and implement a development planning protocol to be used in areas of Koala subpopulations or subpopulation fragments to prevent loss of Koala subpopulations, habitat critical to the survival of the species and vital habitat connectivity. • Development plans should explicitly address ways to mitigate risk of vehicle strike when development occurs adjacent to, or within, Koala habitat. • Develop and implement a management plan to control the adverse impacts of predation on Koalas by dogs in urban, peri-urban and rural environments. • Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them, if necessary. • Identify populations of high conservation priority. • Develop and implement options of vegetation recovery and re-connection in regions containing fragmented Koala populations, including inland regions in which Koala populations were diminished by drought and coastal regions where development pressures have isolated Koala populations. • Investigate formal conservation arrangements, management agreements and covenants on private land, and, for both Crown and private land, investigate and/or secure inclusion of habitat critical to the survival of the Koala in reserve tenure, if possible. • Engage with private landholders and land managers responsible for the land on which populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions. • Manage any other known, potential or emerging threats such a Bell Miner (Manorina melanophrys) associated Dieback or Eucalyptus rust. The Project will not interfere substantially with any of these objectives. Significant areas of potential habitat for this species will be retained in the Project area. Connectivity to the broader landscape will be maintained (including retention of riparian corridors associated with Goonyella Creek).

Table 10.5 Significant impact assessment – Koala (status Endangered EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	Response
	As defined in the EPBC Act referral guidelines for the vulnerable Koala (DoE 2014), impacts which are likely to substantially interfere with the recovery of the Koala may include one or more of the following: • **Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities** – it is unlikely that the Project will lead to increased levels of dog attack. Wild Dogs are present in the Project area and study area. Although there is potential for the Project to increase the existing impact of Wild Dogs on the species, either through attracting more individual dogs or facilitating their ability to attack Koala through habitat clearance, mitigation measures such as disposing of rubbish appropriately, controlling Wild Dog populations and monitoring clearing activities will reduce this risk. • **Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle strikes to a level that is likely to result in multiple, ongoing mortalities** – mitigation measures presented in Chapter 9 relating to vehicle speeds on site and restrictions around movement on site will reduce the risk of vehicle strike to Koala. Project roads will not be heavily trafficked particularly during operation. • **Facilitating the introduction or spread of disease or pathogens for example Chlamydia or Phytophthora, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat** – the Project is not likely to directly result in an increase in Chlamydia in Koalas. This is a broader issue for the population. But through a cumulative loss of Koala habitat and increase in stress on animals from dog attacks and fragmentation of habitat etc. the number of Koalas contracting Chlamydia are increasing. Fauna spotter-catchers will be present during clearing to identify Koalas and ensure they are not harmed during clearing process or as works progress. • **Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala** – the project design will maintain linkages to surrounding retained habitat. Vehicle speeds will be reduced on access roads to minimise vehicle strike. There are tracts of habitat that will remain on site post clearing which are connected to larger habitats in adjacent areas. • **Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term** – as part of the construction planning a certified Erosion and Sediment Control Plan (ESCP) will be prepared prior to construction and implemented during on-site activities. The ESCP will form part of the overall CEMP. Particular focus will be made to managing runoff in the vicinity of areas around watercourses. Additionally, riparian habitat which offers the most likely potential habitat for Koala in the region will be retained. As such the ability for this habitat to act as a refuge for the species will be maintained.

Table 10.5 Significant impact assessment – Koala (status Endangered EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	Response
Conclusion	The Project footprint will result in the loss of 5.0 ha of potential habitat as defined in Section 7.6.6. The majority of higher quality habitat associated with preferred foraging resources such as *E.orgadophila* or *E.cambageana* woodland is avoided. If it occurs, it is likely to be restricted to areas where sparse *Eucalyptus cambageana* are present, or the patch of RE 11.5.3/11.5.15 on Lot 11 or a patch of *Eucalyptus orgadophila* open grassy woodland on Lot 2. However, this habitat is marginal. The remainder of the Project area is largely cleared and dominated by regrowth *Acacia*. This species has not been recorded within the Project area or within the study area. Conservatively it is considered as having potential to occur on the Project area despite there being no evidence of scratches or scats during field surveys. Through the identified mitigation measures such as staged clearing, the Project will ensure impacts on any local Koala population are minimised. The project is unlikely to impact upon the dispersal capacity of the species through areas of Acacia regrowth or cleared areas. As per DCCEEW guidance (Australian National University 2021) cleared areas and acacia regrowth is considered to have the potential to support dispersal of the species between areas of habitat. The pipeline easement will continue to support this function. The Project is not expected to have a significant residual impact on Koala habitat. It is not considered to utilise the Project area on a regular basis.

10.6 White-throated Needletail

10.6.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- species profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682
- Conservation Advice *Hirundapus caudacutus* White-throated Needletail (TSSC 2019)
- draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015a).

There is no Listing Advice or adopted or made Recovery Plan in place for this species.

10.6.2 Ecology, habitat, distribution

In Australia, the White-throated Needletail is almost exclusively aerial, occurring from heights of less than 1 m up to more than 1,000 m above the ground. The species is capable of ascending to altitudes of over 3,000 m (Tarburton 2014).

White-throated Needletail are predominantly aerial, and although they occur over most types of habitat, White-throated Needletails are recorded most often above wooded areas (DAWE 2022e). However, they forage over a wide range of habitats including cleared areas. The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows (Corben et al. 1982).

The species breeds in northern Asia and spends the non-breeding season (typically October–March inclusive) in Australia, favouring eastern and south-eastern areas of the country moving further south as the summer progresses (DAWE 2022e).

The White-throated Needletail is widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of QLD and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains (DAWE 2022e).

10.6.3 Important populations

DCCEEW does not specify what constitutes an important population for White-throated Needletail. As such, the *EPBC Act Significant Impact Guidelines 1.1* (DoE 2013a) are used, which define an important population of a 'vulnerable' species as being populations that are:

- key source populations either for breeding or dispersal
- necessary for maintaining genetic diversity
- near the limit of the species range.

The species occurs widely across eastern Australia, although does not breed in the country. The Project area is not located near the edge of the species range. There is no evidence to indicate a population in the area is likely to be a key population for breeding, dispersal or maintaining genetic diversity in the species.

10.6.4 Threats to the species

Deforestation may contribute to a decline in roosting habitat and/or food availability (Tarburton 2009). Individuals occasionally collide with wind turbines, overhead wires, windows and lighthouses (DAWE 2022e).

No recovery or threat abatement plans are in place for this species.

No recovery or threat abatement plans are in place for this species. The Commonwealth's Approved Conservation Advice for White-throated Needletail (TSSC 2019) lists the following priority conservation actions:

- work with governments in East Asia to minimise destruction of breeding habitat
- identify and protect important habitats in Australia
- enhance existing monitoring programs
- improve knowledge of potential threatening processes such as wind turbines and overhead wires.

10.6.5 Distribution within the Project area and habitat mapping

The species was observed in December 2021 surveys and also observed near the Project area on March 2022 surveys. It is likely to occur sporadically throughout the summer months.

No habitat map has been prepared for this species as it is an aerial insectivore that spend most of its time aloft, and could occur anywhere over the Project area, therefore the whole Project area is considered potential foraging habitat.

The species does not breed in Australia, and as a wide-ranging nomadic species, foraging habitat also provides a surrogate for dispersal habitat.

There is limited potential for roosting habitat in the Project area as there is generally a lack of mature woodland in which the species may roost. It is thought that the number of references to Needletails roosting in trees possibly over-emphasizes such occurrences (DAWE 2021d).

10.6.6 Significant impact assessment

The MNES significant impact assessment for White-throated Needletail using the Significant Impact Guidelines (DoE 2013a) is summarised below in Table 10.6.

Table 10.6 Significant impact assessment – White-throated Needletail (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Lead to a long-term decrease in size of an important population.	White-throated Needletail are a non-breeding visitor to Australia arriving in October and departing by April. Numbers fluctuate on an annual basis and the species is widespread across the eastern coast, moving in response to foraging and weather conditions. The species migrates down the Great Dividing Range, and the Project area is a small component of this broader area and numbers will vary annually in response to weather and foraging conditions. It is an aerial insectivore that spend most of its time aloft, and could occur anywhere over the Project area, therefore the whole Project area is considered potential foraging habitat. As White-throated Needletail are almost exclusively aerial, direct impacts to their habitat are not expected to occur as a result of vegetation clearance for the Project. There is limited potential the species could roost in an area of woodland across the Project area, although this use will be sporadic, temporary and across a broad area (i.e. not involving regular or repeated roost sites). Suitable roost trees (larger more mature trees) are present within mapped woodland on Lot 11 and Lot 2. Following the draft referral guidelines for migratory species under the EPBC Act (DoE 2015a) an ecologically significant proportion of the population of White-throated Needletail is estimated to be 10 birds (0.1% of the total population using the lower population estimate of 10,000 birds). As White-throated Needletail arrive and disperse over a broad front across northern and eastern Australia, it is not expected that the number of birds using the Project area will place an ecologically significant proportion of the population at risk. Further, the mechanisms for the Project to impact on this species are absent.
Reduce the area of occupancy of an important population.	The Project will not result in clearing of breeding habitats for the species, as they do not breed in Australia. The species roosts in dense forest canopies or occasionally on rock faces. Large tracts of vegetation will be retained surrounding the Project area and loss of roosting habitat for such a widespread and mobile species will be negligible. Foraging habitat will be maintained above the Project area. The impact arising from the Project will not result in a detectable decrease in the area of occupancy for an important population.
Fragment an existing important population into two or more populations.	The species is almost exclusively aerial in Australia across a wide range of habitats. It is not expected that the Project will fragment the habitat for this species. The species regularly forages up to 1,000 m ASL.
Adversely affect habitat critical to the survival of a species.	Important habitat for the species is broad as it is found over a range of habitats, but more often over wooded areas where it is almost exclusively aerial (DoE 2015a). The species does not breed in Australia so there is no impact on breeding habitat. As an aerial feeder, habitats for foraging are diverse and occur over woodland, cleared areas, urban environments etc. Although some vegetation clearing will occur during Project construction, there are extensive areas of retained vegetation surrounding the Project area, and cleared habitats are still utilised by the species. As described above, as White-throated Needletail are almost exclusively aerial, direct impacts to their habitat are not expected to occur as a result of the Project. White-throated Needletail arrive and disperse over a broad front across northern and eastern Australia, moving down the Great Dividing Range on migration, and the Project area is a small proportion of this migratory corridor.

Table 10.6 Significant impact assessment – White-throated Needletail (status Vulnerable EPBC Act)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Disrupt the breeding cycle of an important population.	This species does not breed in Australia; therefore, the Project will not disrupt the breeding cycle of the White-throated Needletail.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Important habitat for the species is broad as it is found over a range of habitats, but more often over wooded areas where it is almost exclusively aerial (DoE 2015a). The species does not breed in Australia so there is no impact on breeding habitat. As an aerial feeder, habitats for foraging are diverse and occur over woodland, cleared areas, urban environments etc. Although some vegetation clearing will occur during Project construction, there are extensive areas of retained vegetation surrounding the Project area, and cleared habitats are still utilised by the species. The majority of the Project area will remain as suitable foraging and roosting habitat for the species. As described above, as White-throated Needletail are almost exclusively aerial, direct impacts to their habitat are not expected to occur as a result of the Project.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Pest fauna such as cats are not known as a major threat to the species. Although there is the possibility of roosting individuals being taken by cats, the frequency of such events is likely to be small. The potential for weeds to impact on the quality of foraging habitat is low. Nonetheless, weeds will be identified during preclearance surveys. Hygiene protocols, such as wash-down facilities, will also be put in place to ensure weeds are not brought in with vehicles or machinery.
Introduce disease that may cause the species to decline.	This species is not known to be threatened by disease. The Project is unlikely to introduce diseases that cause the species to decline.
Interfere substantially with the recovery of the species.	There is no State or Commonwealth recovery plan for this species. The Approved Conservation Advice for White-throated Needletail (TSSC 2019) outlines conservation actions intended to aid the recovery of the species (identification of important habitat in Australia, improve knowledge of threatening processes and quantify levels of organochlorines in individuals and prey species). Given the relatively minor extent of clearing involved in relation to retained habitat in the region, and the large distances covered by this species, any potential impact on White-throated Needletail habitat will be minor and is considered unlikely to interfere with the recovery of the species or any of the actions outlined in the Approved Conservation Advice.
Conclusion	The Project is not expected to have a significant residual impact on White-throated Needletail habitat.

10.7 Fork-tailed Swift

10.7.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- species profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=678
- draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015a).

There is no Listing Advice, Conservation Advice or adopted or made Recovery Plan in place for this species.

10.7.2 Ecology, habitat, distribution

The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. It is almost exclusively aerial and occurs over inland plains and sometimes above foothills or in coastal areas. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (DAWE 2022g).

The species breeds in northern Asia and spends the non-breeding season (typically October–March inclusive) in Australia, moving further south as the summer progresses. In their breeding range, they nest on mountain cliffs or island rock caves, inside narrow crevices or in cracks on vertical cliff faces (DAWE 2022g).

The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. In Queensland, there are many coastal records of this species between Cooktown and Townsville, and they are also commonly found in drier habitat inland as far west as Longreach. In eastern Australia, it is recorded in all coastal regions of QLD and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains (DAWE 2022g).

10.7.3 Ecologically significant proportion of the population

DCCEEW does not specify what constitutes an important population for Fork-tailed Swift. In lieu of this, an assessment of an ecologically significant proportion of a population is required for a migratory species. As such, the *EPBC Act Significant Impact Guidelines 1.1* (DoE 2013a) are used, which define an ecologically significant proportion of a population of a 'migratory' species as being defined as:

- Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates.

The species occurs widely across Australia, although does not breed in the country. The Project area is not located near the edge of the species range. There is no evidence to indicate a population in the area is likely to be a key population for breeding, dispersal or maintaining genetic diversity in the species. Migratory swifts are widely dispersed depending on weather and feeding patterns, and as such no site fidelity is expected. As such the species' occurrence in the Project area is unlikely to constitute an ecologically significant proportion of the population.

'Important habitat' for a migratory species is defined as:

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

The species occurs across Australia. There is no evidence to indicate a population in the area is likely to be a key population for breeding, dispersal or maintaining genetic diversity in the species.

The species' occurrence in the Project area is unlikely to constitute an important population or important habitat.

10.7.4 Threats to the species

There are no significant threats to swifts in Australia. Deforestation may contribute to a decline in roosting habitat and/or food availability (Tarburton 2014). Individuals occasionally collide with overhead wires, windows and lighthouses (DAWE 2022g). No recovery or threat abatement plans are in place for this species. There is no approved conservation advice for this species.

10.7.5 Distribution within the Project area and habitat mapping

During surveys this species was identified adjacent to the Project area; therefore, it is considered likely to occur.

No habitat map has been prepared for this species as it is an aerial insectivore that spend most of their time aloft, and could occur anywhere over the Project area, therefore the whole Project area is considered potential foraging habitat. The species does not breed in Australia, and as a wide-ranging nomadic species, foraging habitat also provides a surrogate for dispersal habitat.

10.7.6 Residual impacts and significant impact assessment

The MNES significant impact assessment for Fork-tailed Swift using the Significant Impact Guidelines (DoE 2013a) is summarised below in Table 10.7.

Table 10.7 Significant impact assessment – Fork-tailed Swift (status Migratory EPBC Act)

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	Response
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.	Important habitat for the species is broad as it is found over a range of habitats, from inland plains to wooded areas (DoE 2015a). The species does not breed in Australia so there is no impact on breeding habitat. As an aerial feeder, habitats for foraging are diverse and occur over woodland, cleared areas, urban environments etc. Although some vegetation clearing will occur during Project construction, there are areas of retained vegetation surrounding the Project area, and cleared habitats are still utilised by the species. The species is likely to occur on a sporadic basis over summer months within the Project area. Within the core range of the species, numbers can vary from 0 on one day to over 1,000 the next day with seemingly little pattern, presumably driven by weather and foraging conditions. As Fork-tailed Swift arrive and disperse over a broad front across the whole of Australia, but mainly over inland plains, it is impossible to predict on a long-term basis any patterns of utilisation of a given site, although focal features such as wetlands which may attract a large number of insect prey, could result in an increase in numbers of the species. There are no such wetlands within the Project area. As described above, as swifts are almost exclusively aerial, direct impacts to their habitat are not expected to occur as a result of the Project.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	Pest fauna such as cats are not known as a major threat to the species. The potential for weeds to impact on the quality of foraging habitat is low. Nonetheless, weeds will be identified during preclearance surveys. Hygiene protocols, such as wash-down facilities, will also be put in place to ensure weeds are not brought in with vehicles or machinery.

Table 10.7 Significant impact assessment – Fork-tailed Swift (status Migratory EPBC Act)

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	Response
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	This species does not breed in Australia; therefore, the Project will not disrupt the breeding cycle of the Fork-tailed Swift. As an aerial feeder, habitats for foraging are diverse and occur over woodland, cleared areas, urban environments etc. Although some vegetation clearing will occur during Project construction, there are areas of retained vegetation surrounding the Project area, and cleared habitats are still utilised by the species. As described above, as swifts are almost exclusively aerial, direct impacts to their habitat are not expected to occur as a result of the Project.
Conclusion	The Project will not have a significant residual impact on Fork-tailed Swift habitat and the risk of an impact on an ecologically significant proportion of the population (defined by DoE 2015a as being 100 birds or 0.1% of the population) is considered to be low.

10.8 Latham's Snipe

10.8.1 Relevant Departmental documents

The following documents were considered in the preparation of this report:

- species profile on SPRAT database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=863
- EPBC Act Policy Statement 3.21 *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2017).

There is no Listing Advice, Conservation Advice or adopted or made Recovery Plan in place for this species.

10.8.2 Ecology, habitat, distribution

Latham's Snipe is a shorebird species that breeds primarily in Japan during the Austral winter and spends the Austral summer in eastern Australia. It is most commonly associated with wetlands, creeks or moist grasslands. It is a secretive, well-camouflaged species and is often only revealed to an observer when disturbed into flight (DAWE 2022h). It mainly occurs in permanent and ephemeral freshwater wetlands with low, dense vegetation but can also occur in saline or brackish wetlands that are artificial or modified (Menkhorst et al. 2017).

10.8.3 Important habitat

Latham's Snipe do not aggregate in large flocks as other shorebirds do, or use similar habitats, therefore habitat important to the species is not identified using Figure 2 of EPBC Act Policy Statement 3.21 *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2017). Instead, important habitat for the species is described as "areas that have been identified as internationally important for the species, or areas that support at least 18 individuals of the species".

There is no evidence to indicate the Project area is likely to constitute important habitat for the species.

10.8.4 Threats to the species

Historically the greatest threat to the species in Australia was the drainage and modification of wetland habitats, and excessive mortality due to hunting (DAWE 2022h). Loss of habitat is an ongoing threat.

Some populations occupy wetlands prone to disturbance near industrial complexes etc. Pollution of these wetlands via discharge or inappropriate land management is a potential threat (Melville, 1997).

10.8.5 Distribution within the Project area and habitat mapping

The species has not been recorded in the Project area, although is likely to occur on a sporadic basis if conditions are suitable. Habitat is present within the Project area within areas of gilgai.

10.8.6 Significant impact assessment

The MNES significant impact assessment for Latham's Snipe using the Significant Impact Guidelines (DoE 2013a) is summarised below in Table 10.8.

Table 10.8 Significant impact assessment – Latham's Snipe (status Migratory EPBC Act)

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	Response
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.	Important habitat for the species is defined (DoE 2017) as being areas that have been identified as internationally important for the species, or areas that support at least 18 individuals of the species. There is no evidence the Project area supports this many individuals in the summer months. Extensive areas of potential habitat are present within the Project area, in the form of gilgai habitats. Approximately 36 ha of habitat will be removed as a result of the Project, although extensive areas of gilgai will be retained surrounding the Project area. Therefore, the Project is not likely to have a significant impact on an area of important habitat for the species. Due to the extensive areas of retained habitat and the transitory nature of any occurrence, the Project area is expected to be able to accommodate Latham's Snipe occurring in the region in the summer months. Therefore, the Project is not likely to have a significant impact on the species' habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	There is limited scope for indirect impacts such as weed and pest interaction with this species resulting from Project construction. Pest fauna such as cats are not known as a major threat to the species. Although there is the possibility of individuals being taken by cats, the frequency of such events is likely to be small. The potential for weeds to impact on the quality of foraging habitat is low. Weed and pest control measures as outlined in Section 9.10 will be in place to minimise the risk of Project activities further facilitating the spread of weeds and pests across the landscape.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	It is unlikely that the Project will disrupt the lifecycle of an ecologically significant proportion of the population – DoE (2017) defines an ecologically significant proportion of the population as being 18 birds. Any population occurring in the Project area would likely number less than a few birds.
Conclusion	Although 36 ha of potential habitat will be cleared during construction, the loss of this habitat will not have a significant residual impact on Latham's Snipe and the risk of an impact on an ecologically significant proportion of the population is considered to be low.

11 Environmental offsets – residual significant impacts

Environmental offsets are required to be delivered in accordance with the *EPBC Act Environmental Offsets Policy* (DoEE 2012) for MNES where a significant, residual impact is predicted to occur after avoidance and mitigation measures are considered. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act (DoEE 2012). Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any significant residual impact.

Based on completed significant residual impact assessments (Section 10.1) it has been concluded that the Project will require the following offsets:

- Ornamental Snake (MNES) – a total of 36.05 ha of preferred habitat and 19.62 ha of connectivity/dispersal habitat between areas of preferred habitat is mapped in the Project area.
- Endangered RE 11.4.9 (MSES) – 3.04 ha.

QPM Energy has performed an assessment of offset availability and has undertaken a process of identification of potential offset sites based on desktop analysis.

QPM Energy is proposing to deliver environmental offsets through a staged approach with direct land-based offsets preferred for both Ornamental snake and Endangered RE 11.4.9.

Several preliminary potential offset sites have been identified through initial desktop offset analysis that could meet the offset liability of the Project, demonstrating that there are large areas of suitable vegetation and habitats available in the landscape, not far from the impact area, and the offset areas can be placed on strategically located properties to maximise conservation outcomes and connectivity.

Ground-truthing of each proposed offset property would be required to further validate suitability of vegetation communities and Ornamental Snake habitat, to assess starting habitat quality, confirm management actions required and ascertain habitat quality gains that can be achieved.

The offset sites identified under this assessment do not necessarily represent the final offset sites or definitively reflect all offset requirements however demonstrates the feasibility of offset site selection in the region.

Further detail in provided in the draft Environmental Offset Strategy (refer Appendix M).

12 Environmental outcomes and ecologically sustainable development

The overarching environmental outcomes sought to be achieved by QPM Energy for MNES are:

- minimise clearing of MNES habitats
- avoid and minimise injuries or mortality of MNES species during all Project phases
- disturbance does not occur to MNES habitats outside of approved Project stages.

12.1 MNES Performance Outcomes

Environmental outcomes specific to each MNES are listed in Table 12.1.

Table 12.1 Specific environmental outcomes for MNES

MNES	Specific environmental outcomes
Brigalow TEC	• No more than 0.8 ha of Brigalow TEC will be cleared. • No fire will be permitted to occur in Brigalow communities. • Weed hygiene protocols will be implemented to reduce the potential for introduction or spread of weeds.
Ornamental Snake	• No more than 55.68 ha of Ornamental Snake habitat will be cleared. • Avoid and minimise injury and mortality to Ornamental Snake across the Project area through sequential clearing, preclearance surveys and relocation of animals, reducing vehicle speed and reducing pest animal populations that are a direct threat to species. • Weed hygiene protocols will be implemented to reduce the potential for introduction or spread of weeds.
Squatter Pigeon	• No more than 31.67 ha of Squatter Pigeon habitat will be cleared and no more than 9.6 ha of breeding habitat. • Avoid and minimise injury and mortality to Squatter Pigeon across the Project area through sequential clearing, reducing vehicle speed and reducing pest animal populations that are a direct threat to species. • Weed hygiene protocols will be implemented to reduce the potential for introduction or spread of weeds.
Koala	• No more than 5.0 ha of potential Koala habitat will be cleared. • No Koalas are injured during vegetation clearing. • Avoid and minimise injury and mortality to Koalas across the Project area through the use of best management practices associated with all Project phases. • Koala habitat connectivity is maintained along riparian corridors by minimising clearing widths and where possible post construction revegetating with Koala food trees.
White-throated Needletail and Fork-tailed Swift	• These species are not likely to be impacted, therefore no specific outcomes are prescribed.
Latham's Snipe	• Avoid and minimise injury and mortality to Latham's Snipe across the Project area through sequential clearing, reducing vehicle speed and reducing pest animal populations that are a direct threat to species.

12.2 Ecologically sustainable development

The *Guidelines for Section 516A reporting – Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010) is a non-mandatory document developed to assist Commonwealth agencies meet their statutory annual reporting requirements under Section 516A of the EPBC Act.

Australia's National Strategy for Ecologically Sustainable Development (1992) defines ecologically sustainable development as '*using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*.'

The following ecologically sustainable development (ESD) principles are outlined in Section 3A of the EPBC Act:

- The integration principle – decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.
- The precautionary principle – if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- The intergenerational principle – the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- The biodiversity principle – the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.
- The valuation principle – improved valuation, pricing and incentive mechanisms should be promoted.

The Project is anticipated to support the delivery of substantial benefits to metallurgical coal mining operations in the Northern Bowen Basin by providing a beneficial use for coal mine waste gas beyond flaring and venting that is currently used to dispose of extracted methane.

The Project design has been refined progressively in response to the availability of information on the characteristics of the Project area in order to avoid, minimise and mitigate potential adverse impacts. With consideration of the extensive assessment included within this report, it is concluded that the Project represents a sound land use planning outcome for the Project area and embodies the principles of ESD.

The precautionary principle was considered for the application. The proposed activities will use 'proven' technology and sufficient scientific data exists to predict the likely impacts of the activity. The principle of intergenerational equity was considered for the application. The proposed activities would be conducted in a manner which ensure the health, productivity and diversity of the environment. This will include minimises disturbance as far as practicable and rehabilitating disturbed areas. The principles of conservation of biological diversity and ecological integrity were considered for the application.

13 Economic and social matters

13.1 Economic matters

The Project is a strategically significant development which will supply up to 25 petajoules per year (PJ/a) of waste coal mine gas via the existing underutilised NQGP to users in Townsville. QPM's TECH Project will produce battery nickel and cobalt and a number of by-products from laterite ores and will consume around 13 PJ/a. Additional gas will be available to third party users to foster industrial development and generation of peak power to supplement a rapidly growing regional renewable energy capacity.

The Commonwealth Government through the Department of Defence has announced support for Licella to develop Sustainable Aviation Fuel facility in the Burdekin, south of Townsville. Waste coal mine gas is an essential transitional source of energy to underpin the development of world class sustainable aviation fuel in North Queensland[1].

The State Government has announced investment to promote the region as a key Critical Minerals Hub which will depend on coal mine waste gas as a transitional fuel to secure continuous operation[2].

The Project is anticipated to support the delivery of substantial benefits to metallurgical coal mining operations in the Northern Bowen Basin by providing a beneficial use for coal mine waste gas beyond flaring and venting that is currently used to dispose of extracted methane.

Beneficial use of the gas avoids additional greenhouse gas emissions when used to generate energy or chemicals which would otherwise use coal or natural gas. It significantly reduces global greenhouse gas emissions when compared to vented methane which has a GHG intensity of 80 over the first 20 years compared to carbon dioxide. The GHG intensity is 27 times more potent than carbon dioxide over 100 years. The extremely high early years intensity makes methane reduction a high priority target. Methane is responsible for around 30% of the rise in global temperatures since the Industrial Revolution, and rapid and sustained reductions in methane emissions are key to limiting near-term global warming and improving air quality. Reducing fugitive coal mine methane will be essential for Queensland to meet its targets for GHG reduction of 30% emissions reduction below 2005 levels by 2030 and zero net emissions by 2050[3].

Tackling methane emissions from the energy sector represents one of the best near-term opportunities for limiting global warming because the pathways for reducing them are well known and often cost-effective. The resources sector in particular has the know-how and resources to take quick action.

The Project is an example of a facility which captures gas, creates a beneficial use which avoids methane venting and flaring which also loses methane to atmosphere.

The facility will provide an important step for miners to meet targets and to reduce greenhouse gas emissions in the Northern Bowen Basin which is an area noted for its regionally important high quality metallurgical coals and very high gas content mines. It will position metallurgical coal miners to produce cleaner coal and continue to enhance Australia's importance and role in producing higher quality premium coal products for export.

The Project also proposes to provide competitively priced domestic gas that can be used to generate electricity at Townsville Yabulu Station (approximately 244 megawatts (MW)) to meet late afternoon and evening peak power requirements.

[1] https://propack.pro/fed-govt-supports-licellas-australian-first-biorefinery-with-5m-grant/

[2] https://statements.qld.gov.au/statements/97031

[3] https://www.des.qld.gov.au/climateaction

13.2 Social matters

13.2.1 Public consultation

QPM Energy is committed to the ongoing engagement with local community and other stakeholders. Since Project inception, QPM Energy has had ongoing engagement with regulatory authorities, Isaac Shire Council and landowners, lessees, Traditional Owners and tenure holders.

Table 13.1 summarises consultation activities undertaken to date.

Table 13.1 Consultation activities

Stakeholder	Description on consultation	Outcome
DCCEEW	Pre-referral and approvals process management discussions.	Approvals pathway determined and information requirements (to support assessment processes) specified.
DES	Pre-lodgement and approvals process management discussions.	Approvals pathway determined and information requirements (to support assessment processes) specified.
Isaac Regional Council	Meetings/discussions on: • traffic • road access to the site via Red Hill Road (road reserved currently closed) • maintenance arrangements for road infrastructure • Goonyella Road Users Group (funds and administers a section of Goonyella Road servicing coal mines to the North of Moranbah).	Ongoing discussions Negotiation of a Road Maintenance Agreement to support direct access to the Project via Red Hill Road from Goonyella Road.
Stanmore (landowner) and its lessees	Project briefing and ongoing updates. Land access for environmental surveys. Design discussions/briefings. Pre-mine drainage in the region.	Establishment of a Memorandum of Understanding (MoU) on the location and tenure arrangements of the Project. Confirmation of hydrocarbon rights within ML1790.
Palisade Investment Partners Limited (NQGP asset owner)	Access and use of the NQGP (gas transmission agreement).	Advancement of an access agreement discussions.
Peabody Resources	Project briefing and ongoing updates. Design discussions/briefings. Pre-mine drainage in the region, noting that Peabody has commenced drilling to remove gas for underground operations.	Advancement of a Co-existence Agreement (for the co-location[4] of PFL33, PL504 and ML 6949).

[4] The overlap occurs as a consequence of the Queensland Government sub-block methodology used to define PFL areas which leads to a larger PFL reservation than required for the active impact areas of the GCF.

Table 13.1 Consultation activities

Stakeholder	Description on consultation	Outcome
Arrow Petroleum	Project briefing and ongoing updates. Design discussions/briefings. Pre-mine drainage in the region.	Advancement of a Co-existence Agreement (for the co-location[5] of PFL33, PL486 and ATP 364).
BHP Billiton	Project briefing and ongoing updates. Design discussions/briefings. Discussions with BHP Coal regarding the Moranbah Water Pipeline along Red Hill Road.	Discussion commenced on the advancement of a Co-existence Agreement. Confirmation that the Goonyella Road Users Group will be seeking contribution to maintain Goonyella Road. Identification of maintenance requirements for Goonyella/Red Hill Road.
Aurizon (railway operator)	Identification of approvals and information requirements to allow the crossing (underboring) of the rail corridor by the Project.	Lodgement of a wayleave application and crossing design to Aurizon for approval. Discussions will be ongoing (into the construction phase) to finalise the Wayleave Agreement.
Sunwater (water pipeline operator)	Identification of approvals and information requirements to allow the crossing (underboring) of water pipeline infrastructure by the Project.	Lodgement of a pipeline crossing application to Sunwater for approval. Currently awaiting feedback.

Formal notification of the Project's approvals has been or will be undertaken as summarised in Table 13.2.

Table 13.2 Project notification activities - approvals

Approval type	Description of notification		
	Process	Duration	Completed
Environmental Authority A-EA-NEW-100324062 *Environmental Protection Act 1994* (Queensland)	• Advertisement placed on News Corp website. • EA documentation made available on: – QPM website – https://qpmetals.com.au/tech-project/project-approvals/ – DES website – https://environment.des.qld.gov.au/management/activities/non-mining/regulation/environmental-authority/current-ea-applications#petroleum_and_gas_applications • one submission received.	7 November 2022 to 2 December 2022	Yes
Petroleum Pipeline Licence PPL 2073 *Petroleum and Gas (Production and Safety) Act 2004* (Queensland)	• Advertisement placed on News Corp website. • Documentation made available on: – QPM website – https://qpmetals.com.au/tech-project/project-approvals/ – GeoResGlobe – https://georesglobe.information.qld.gov.au/. • No submissions received.	3 December 2022	Yes

[5] The overlap occurs as a consequence of the Queensland Government sub-block methodology used to define PFL areas which leads to a larger PFL reservation than required for the active impact areas of the GCF.

Table 13.2 Project notification activities - approvals

Approval type	Description of notification		
	Process	Duration	Completed
Referral 2022/09329 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	• Documentation made available on: – DCCEEW website – https://epbcpublicportal.awe.gov.au/all-referrals/project-referral-summary/?id=556391e6-8a18-ed11-b83e-00224818a1ee. • No submissions received.	6 October 2022 to 20 October 2022	Yes
Invitation for public comment on Preliminary Documentation 2022/09329 (EPBC Act)	• Preparation of a notice to be placed on QPM Energy's website, in a State newspaper and local newspaper. • The draft PD to be printed and placed at a state library and a local library (or Council) building for the public to provide comment.	Friday June 30 2023 to Monday 17 July 2023	Yes

13.2.2 Indigenous consultation

QPM Energy respects the unique and important association Traditional Owners (TOs) and local Indigenous communities have for 'country' - the land, environment, culture and traditional way of life. QPM Energy has established and will maintain a strong relationship with TOs and Aboriginal people associated with the Project. QPM Energy has engaged with native title lawyers and Traditional Owners and their advisers to assess the relevant Cultural Heritage and Native Title parties for the areas spanning the Project, including:

- Widi People of the Nebo Estate #1 represented by Gangal Narra Widi Aboriginal Corporation Registered Native Title Body Corporate (RNTBC) (Widi#1)
- Wiri People #2 represented by Wiri Community Ltd (Wiri#2)
- Widi People of the Nebo Estate #2 represented by Gangal Narra Widi Aboriginal Corporation RNTBC (Widi#2)
- Jangga People represented by Bulganunna Aboriginal Corporation RNTBC.

Cultural heritage surveys have been undertaken with the Jangga People, in January 2023, and the Widi/Wirri People, in August 2022. Surveys identified a number of artifacts which have been logged and, where appropriate (e.g. isolated items), relocated off the proposed project footprint.

High density sites will be managed through the proposed Cultural Heritage Management Plan (CHMP) to be developed by both the parties with the supporting advice of the archaeologist. Discussions with the QPM Energy has also met with and visited the project area with the Jangga People to undertake a cultural heritage survey of the last 4 km of the pipeline corridor.

Cultural Heritage Management Plans (CHMPs) are being negotiated with relevant parties.

An Indigenous Land Use Agreement (ILUA) is being negotiated with the Widi People of the Nebo Estate No 1. The proposed area was accepted by the National Native Title Tribunal on 12 January 2023.

QPM Energy are committed to:

- Ensuring that cultural heritage is respected and preserved by staff and its contractors.
- Creating and maximising Project employment opportunities for the Traditional Owners of the land.
- Ensuring representatives from all Traditional Owners to be in attendance during local works such as the geotechnical investigation, to ensure that if any artefacts of cultural significance are found they are handled appropriately.

14 Environmental record of the proponent

In developing the Project and its gas supply business, QPM has established QPM Energy as a wholly owned but stand alone and independently managed entity.

QPM Energy is a suitable operator (reference # 100294011) pursuant to the EP Act.

No past or present proceedings for environmental offences have been applied to QPM.

QPM promotes sustainable environmental practices and transparent communication with our stakeholders. This Policy applies to all personnel involved in QPM activities including employees, consultants, contractors and visitors. QPM management are committed to the following throughout design, construction and operation:

- managing adverse environmental impacts though identification, setting objectives and targets and implementing mitigation programs
- employing new technologies at the design phase and during our operations to reduce wastes and minimise carbon emissions
- ensuring our operations will comply with environmental laws, regulations and codes of practice
- fostering continuous improvement of our environmental management systems and practices to meet ISO140001
- engaging with our employees, customers and investors on environmental issues and report on our environmental performance
- respecting individuals and their cultures
- supporting local and Indigenous businesses and create lasting opportunities for the development of local and Indigenous workers
- working with our stakeholders to develop genuine relationships, through open and transparent communication, and reporting.

This policy reinforces QPM's commitments to environmental sustainability and to creating value to the local community.

15 Conclusion

EMM has been commissioned by QPM Energy to undertake ecological assessments for the proposed QPM Energy Project, comprising a GCF and high-pressure pipeline. This assessment included a desktop review and field surveys to characterise the MNES values of the Project area and defined study area.

Key results of the assessment are summarised as follows:

- presence of Endangered REs and Brigalow TEC
- threatened species habitat, including confirmed records of Ornamental Snake and Squatter Pigeon with records of White-throated Needletail close by (within 3 km)
- no flora protected under the EPBC Act were recorded.

A significance of residual impacts assessment was undertaken of the Project's potential impacts on MNES that have been confirmed present or are considered likely to occur within the subject site. The assessment was made against the EPBC Act Significant Impact Guidelines 1.1 (DoE 2013).

The Project has the potential to result in significant residual impacts to Ornamental Snake. After heavy rain on 10 March 2022, a total of nine individuals were recorded on Lot 23 and on the following night, a total of 30 individuals were recorded in the same area. All individuals were in the gilgai on the eastern part of the property, although it is likely individuals would have been recorded in the western part of the alignment too if this area had been accessed (was not possible due to flooding). A further five individuals were recorded in November 2022.

Additionally, the species has potential to occur in parts of Lot 11 and Lot 2 where Brigalow communities on clay soils are present adjacent to extensive areas of gilgai. These areas are mapped as potential dispersal habitat.

Key avoidance and mitigation measures to be implemented to ensure significant, residual impacts do not occur to MNES are:

- Design the Project to avoid areas of high ecological value where practicable. This has already been a principle in design and micro-siting of infrastructure will continue to be employed where practical.
- Develop a Species Management Program (required by DES under the NC Act when impacting on animal breeding places) to identify specific measures to be implemented that will mitigate impacts to threatened fauna species and animal breeding places during clearing, as well as operation of the Project.
- Sequential clearing is to be implemented. This will ensure impacts to fauna during clearing are avoided and minimised. A suitably qualified fauna spotter-catcher will be present during clearing to ensure native fauna are not impacted.
- Potential indirect impacts to MNES will be managed through implementation of measures such as weed hygiene protocols, managing weeds in retained bushland areas, reducing noise and lighting and managing stormwater runoff. These measures will be detailed in management plans to be prepared during detailed design.

References

Adams-Hosking, C, Grantham, H, Rhodes, J, McAlpine, C, & Moss, P (2011). Modelling climate-change-induced shifts in the distribution of the koala. *Wildlife Research* 38, 122–130.

Atlas of Living Australia (ALA) 2022. *Dichanthium setosum* occurrence records. Accessed online 21/07/2022 at https://biocache.ala.org.au/occurrences/search?q=lsid:https://id.biodiversity.org.au/node/apni/2905357#tab_mapView

Barber-Meyer, S (2007). Photopollution impacts on the nocturnal behaviour of the Sugar Glider (*Petaurus breviceps*). *Pacific Conservation Biology* 13, 171–176.

Borsboom, A.C., Couper P.J., Amey A., Hobson R. & Wilson S.K. (In prep.). (2008). Rediscovery of the endangered Retro Slider (*Lerista allanae*) in the Clermont region of central Queensland. Scientific report. Queensland Department of Environment and Resource Management and the Queensland Museum. Scientific report, Queensland Department of Environment and Resource Management and the Queensland Museum, Brisbane.

Bureau of Meteorology (BOM) (2020). *Groundwater Dependent Ecosystems Atlas*. BOM. Available from: http://www.bom.gov.au/water/groundwater/gde/map.shtml

BOM (2022a). Moranbah, Queensland. March 2022 daily weather observations. Accessed online at http://www.bom.gov.au/climate/dwo/202203/html/IDCJDW4087.202203.shtml

BOM (2022b). Moranbah, Queensland. June 2022 daily weather observations. Accessed online at http://www.bom.gov.au/climate/dwo/202206/html/IDCJDW4087.202206.shtml

Butler, DW (2007) Recovery plan for the "Brigalow (*Acacia harpophylla* dominant and co-dominant" endangered ecological community (draft of 1 May 2007). Report to the Department of the Environment and Water Resources, Canberra. Queensland National Parks and Wildlife Service, Brisbane.

Clean Energy Regulator (2022). *Global Warming Potentials*. Accessed online at https://www.cleanenergyregulator.gov.au/NGER/About-the-National-Greenhouse-and-Energy-Reporting-scheme/global-warming-potentials.

Corben, C, Roberts, G & Smyth, A (1982). Roosting of a White-throated Needletail. *Sunbird* 12, 47–48.

DAWE (2020) Provisional list of animals requiring urgent management intervention. Accessed from https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-animals Australian Government.

DAWE (2021). Draft Consultation on Species Listing Eligibility and Conservation Actions *Petauroides volans* (Greater Glider (southern). Available from: https://www.environment.gov.au/biodiversity/threatened/nominations/comment/greater-glider-southern

DAWE (2022a). *Denisonia maculata* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022b). *Geophaps scripta scripta* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022c). *Rostratula australis* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022e) *Hirundapus caudacutus* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022f). *Phascolarctos cinereus* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022g). *Apus pacificus* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022h). *Gallinago hardwickii* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022i). *Dichanthium queenslandicum* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022j). *Calidris ferruginea* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022k). *Egernia rugosa* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022l). *Erythrotriorchis radiatus* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022m). *Furina dunmalli* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022n) *Grantiella picta* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022o). *Neochmia ruficauda ruficauda* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022p) *Poephila cincta cincta* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022q). *Rheodytes leukops* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022r). *Tyto novaehollandiae* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022s). *Bertya opponens* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022t). *Dichanthium setosum* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022u). *Eucalyptus raveretiana* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022v). *Solanum graniticum* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DAWE (2022w). *Calidris melanotos* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

DCCEEW (2023). *Denhamia megacarpa* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of the Environment (DoE) (2008a). Approved Conservation Advice for *Dichanthium setosum* (Blue-grass). Commonwealth of Australia.

Department of the Environment (DoE) (2008b). Threat abatement plan for predation by the European red fox. Australian Government.

Department of the Environment (DoE) (2013a). *Matters of National Environmental Significance Significant Impact Guidelines 1.1*. Commonwealth of Australia.

Department of the Environment (DoE) (2013b). Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community. Commonwealth of Australia.

Department of the Environment (DoE) (2013c). Approved Conservation Advice for *Dichanthium queenslandicum* (King Blue-grass). Commonwealth of Australia.

Department of the Environment (DoE) (2014). *EBPC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory).* Commonwealth of Australia.

Department of Environment DoE 2014, *Approved Conservation Advice for Denisonia maculata (Ornamental Snake),* retrieved 24 May 2021 from http://www.environment.gov.au/biodiversity/threatened/species/pubs/1193-conservation-advice.pdf

DoE (2015a). *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act*. Commonwealth of Australia.

DoE (2015b). Threat abatement plan for predation by feral cats. Australian Government.

DoE (2016). Threat abatement plan for competition and land degradation by rabbits. Australian Government.

DoE (2017). *EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*. Commonwealth of Australia.

Department of Environment and Science (2015) *Regional ecosystem technical descriptions. Brigalow belt land zone 1-5.* Queensland Government, Brisbane.

Department of Environment and Science (DES) (2018), *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland v3.0*, The State of Queensland.

Department of Environment and Science (DES) (2019) Wetland*Maps 2.0* – Interactive Maps and Wetlands Data in Queensland, Wetland*Info* website, accessed 5 May 2022. Available at: https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/get-mapping-help/wetland-maps/

Department of Environment and Science (DES) (2022a). Species Profile – *Elysea albagula*. State of Queensland. Available at https://apps.des.qld.gov.au/species-search/

Department of Environment and Science (DES) (2022b). Species Profile – *Dichanthium queenslandicum*. State of Queensland. Available at https://apps.des.qld.gov.au/species-search/

Department of Environment and Science (DES) (2022c). Species Profile – *Samadera bidwillii*. State of Queensland. Available at https://apps.des.qld.gov.au/species-search/

Department of the Environment, Water, Heritage and the Arts (DEHWA) (2010a). *Survey guidelines for Australia's threatened bats*. Commonwealth of Australia.

Department of the Environment, Water, Heritage and the Arts (DEHWA) (2010b). *Survey guidelines for Australia's threatened birds*. Commonwealth of Australia.

Department of the Environment, Water, Heritage and the Arts (DEHWA) (2010c). *Survey guidelines for Australia's threatened frogs*. Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2008). *The Commonwealth Listing Advice on Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin*. Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011a). *Survey guidelines for Australia's threatened reptiles*. Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011b). *Survey guidelines for Australia's threatened mammals*. Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011c). Draft referral guidelines for the nationally listed Brigalow Belt reptiles. Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2012). *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses*. Commonwealth of Australia.

EMM. (2021). QPM pipeline, initial environmental constraints analysis, Moranbah (draft for discussion).
EMM (2022). QPM Energy Project Surface Water Assessment Technical Report

EUCLID Eucalypts of Australia Edition 4 (2015), internet based, hosted by the Identic Pty Ltd, Brisbane.)

Eyre TJ, Ferguson DJ, Hourigan CL, Smith GC, Mathieson MT, Kelly, AL, Venz MF, Hogan, LD & Rowland, J (2018). *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*. Queensland Government.

Eyre, TJ, Kelly, AL, Neldner, VJ, Wilson, BA, Ferguson, DJ, Laidlaw, MJ & Franks, AJ (2015). *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual.* Version 2.2. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane.

Gibbons P & Lindenmayer DB (2002) Tree hollows and wildlife conservation in Australia. CSIRO Publishing, Collingwood.

Melville, D.S (1997). Threats to waders along the East Asian-Australasian Flyway. In: Straw, P., ed. Shorebird conservation in the Asia-Pacific region. Page(s) 15-34. Melbourne, Victoria: Birds Australia.

Menkhorst, P, Rogers, D, Clarke, R, Davies, J, Marsack, P, & Franklin, K (2017). *The Australian Bird Guide*. CSRIO Publishing, Clayton, Australia.

Neldner, VJ, Wilson, BA, Dillewaard, HA, Ryan, TS, Butler, DW, McDonald, WJF, Richter, D, Addicott, EP & Appleman, CN (2022). *Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland Version 6.0*. Queensland Government.

Pizzey, G & Knight, F (2012). *The Fieldguide to the Birds of Australia*, Harper Collins Publishers, Sydney, Australia.

Scanlan, JC (1991) Woody overstorey and herbaceous understorey biomass in *Acacia harpophylla* (Brigalow) woodlands. Australian Journal of Ecology 16: 521-530.

Seabrook-Davison, MNH (2017). *Oriental cuckoo*. New Zealand Birds Online. Available from: http://www.nzbirdsonline.org.nz/species/oriental-cuckoo

Squatter Pigeon Workshop (2011). Proceedings from the workshop for the Squatter Pigeon (southern). 14-15 December 2011. Toowoomba Office of the Queensland Parks and Wildlife Service.

Tarburton, MK (2009). Why are White-throated Needletails and Fork-tailed Swifts often last observed in southern Australia when migrating northwards? *Australian Field Ornithology* 26, 19-24.

Threatened Species Scientific Committee (TSSC) (2001). Commonwealth Listing Advice for Brigalow TEC. Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2005). *Non-approved Conservation Advice on Northern Quoll (Dasyurus hallucatus).* Australian Government.

Threatened Species Scientific Committee (TSSC) (2012a). Commonwealth Listing Advice for *Dichanthium setosum* (Koala*)*. Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2012b). Koala Approved Conservation Advice for *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Koala Northern Designatable Unit). Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2012c). Commonwealth Listing Advice for *Phascolarctos cinereus* (Koala*)*. Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2013). Commonwealth Listing Advice for *Dichanthium queenslandicum* (King Blue-grass*)*. Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2015a). Conservation Advice *Geophaps scripta scripta* Squatter Pigeon (southern). Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2015b). Conservation Advice *Nyctophilus corbeni* Corben's Long-eared Bat. Commonwealth of Australia.

Threatened Species Scientific Committee (TSSC) (2016). Conservation Advice *Petauroides volans*. Australian Government.

Threatened Species Scientific Committee (TSSC) (2019). Conservation Advice *Hirundapus caudacutus* White-throated Needletail. Commonwealth of Australia.

Van der Ree, R, Ward, SJ, & Handasyde, KA (2004). *Distribution and conservation status of possums and gliders in Victoria.* In The Biology of Australian Possums and Gliders (eds R. L. Goldingay & S. M. Jackson), pp. 91-110. Surrey Beatty and Sons, Sydney.

Wilson, S, Swan, G (2010). *Complete Guide to Reptiles of Australia*.

Woinarski, JCZ, Burbidge, AA, & Harrison, PL (2014). The Action Plan for Australian Mammals 2012. CSIRO Publishing, Collingwood.

Appendix A

Desktop Searches

QUEENSLAND PACIFIC METALS

EMM
creating opportunities

A.1 PMST

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 12-Jan-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	28
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	25
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Grantiella picta			
Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Neochmia ruficauda ruficauda			
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area	In feature area
Poephila cincta cincta			
Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Tyto novaehollandiae kimberli			
Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Dasyurus hallucatus			
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area
Macroderma gigas			
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides minor			
Greater Glider (northern), Greater Glider (north-eastern Queensland) [92008]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
PLANT			
Bertya opponens [13792]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Denhamia megacarpa Large-fruited Denhamia [91342]	Endangered	Species or species habitat may occur within area	In buffer area only
Dichanthium queenslandicum King Blue-grass [5481]	Endangered	Species or species habitat known to occur within area	In feature area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat may occur within area	In feature area
Solanum graniticum Granite Nightshade [84819]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area	In feature area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area	In feature area
Elseya albagula Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat may occur within area	In feature area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lerista allanae			
Allan's Lerista, Retro Slider [1378]	Endangered	Species or species habitat may occur within area	In feature area
Rheodytes leukops			
Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
[Anseranas semipalmata](#) Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In buffer area only
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Bubulcus ibis as Ardea ibis](#) Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Moranbah North Extension Project, Moranbah, Qld	2018/8338		Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Queensland Pacific Metals (QPM) Energy Project, high-pressure gas pipeline and gas compression facility	2022/09329		Assessment	In feature area
Controlled action				
Alpha Coal Project - Mine and Rail Development	2008/4648	Controlled Action	Post-Approval	In feature area
Arrow Bowen Pipeline (CSG), QLD	2012/6459	Controlled Action	Post-Approval	In buffer area only
BHP Billiton Goonyella to Abbot Point rail project	2011/6082	Controlled Action	Completed	In feature area
Bowen Gas Project	2012/6377	Controlled Action	Post-Approval	In feature area
Central Queensland Integrated Rail Project	2012/6322	Controlled Action	Completed	In feature area
Central Queensland Integrated Rail Project	2012/6321	Controlled Action	Completed	In feature area
Eaglefield Expansion Project - new open-cut coal mine pit	2009/4682	Controlled Action	Completed	In feature area
Ellensfield Underground Coal Mine	2007/3643	Controlled Action	Post-Approval	In buffer area only
Establishment of Galilee Coal Mine and Associated Infrastructure	2009/4737	Controlled Action	Post-Approval	In feature area
Galilee Infrastructure Corridor Project	2012/6489	Controlled Action	Guidelines Issued	In buffer area only
Gas pipeline	2002/728	Controlled Action	Post-Approval	In feature area
Goonyella Riverside Coal Mine Expansion	2005/2248	Controlled Action	Completed	In buffer area only
Goonyella Riverside Mine to South Walker Creek Mine Dragline Move	2016/7788	Controlled Action	Completed	In buffer area only
New Lenton Coal Project	2012/6303	Controlled Action	Completed	In buffer area only
New Lenton Coal Project, 65kms north of Moranbah, QLD	2020/8778	Controlled Action	Assessment Approach	In buffer area only
Red Hill Mining Project,20kms north of Moranbah, Qld	2013/6865	Controlled Action	Post-Approval	In buffer area only
Wollombi Open Cut Coal Mine (Suttor Creek ML4761 Extension)	2005/2015	Controlled Action	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Construction of Burdekin Pipeline	2005/2209	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Mining exploration on Wards Well West Project, Bowen Basin, Qld	2014/7256	Not Controlled Action	Completed	In buffer area only
North Goonyella Coal Co-disposal Facility	2008/4570	Not Controlled Action	Completed	In buffer area only
Rail link in central Qld	2005/2170	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
BHP Mitsui Coal???s Wards Well Exploration Program, QLD	2011/5820	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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A.2 Wildlife Online

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 09-May-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	26
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	24
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus			
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos			
Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Geophaps scripta scripta			
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Grantiella picta			
Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Neochmia ruficauda ruficauda			
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area	In feature area
Poephila cincta cincta			
Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Tyto novaehollandiae kimberli			
Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Dasyurus hallucatus			
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area
Macroderma gigas			
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides volans			
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
PLANT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bertya opponens [13792]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dichanthium queenslandicum King Blue-grass [5481]	Endangered	Species or species habitat likely to occur within area	In feature area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat may occur within area	In feature area
Solanum graniticum Granite Nightshade [84819]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area	In feature area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area	In feature area
Elseya albagula Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Lerista allanae Allan's Lerista, Retro Slider [1378]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rheodytes leukops Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In buffer area only
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Alpha Coal Project - Mine and Rail Development	2008/4648	Controlled Action	Post-Approval	In feature area
Arrow Bowen Pipeline (CSG), QLD	2012/6459	Controlled Action	Post-Approval	In buffer area only
BHP Billiton Goonyella to Abbot Point rail project	2011/6082	Controlled Action	Completed	In feature area
Bowen Gas Project	2012/6377	Controlled Action	Post-Approval	In feature area
Central Queensland Integrated Rail Project	2012/6322	Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Central Queensland Integrated Rail Project	2012/6321	Controlled Action	Completed	In feature area
Eaglefield Expansion Project - new open-cut coal mine pit	2009/4682	Controlled Action	Completed	In feature area
Ellensfield Underground Coal Mine	2007/3643	Controlled Action	Post-Approval	In buffer area only
Establishment of Galilee Coal Mine and Associated Infrastructure	2009/4737	Controlled Action	Post-Approval	In feature area
Galilee Infrastructure Corridor Project	2012/6489	Controlled Action	Guidelines Issued	In buffer area only
Gas pipeline	2002/728	Controlled Action	Post-Approval	In feature area
Goonyella Riverside Coal Mine Expansion	2005/2248	Controlled Action	Completed	In buffer area only
Goonyella Riverside Mine to South Walker Creek Mine Dragline Move	2016/7788	Controlled Action	Completed	In buffer area only
Moranbah North Extension Project, Moranbah, Qld	2018/8338	Controlled Action	Post-Approval	In buffer area only
New Lenton Coal Project	2012/6303	Controlled Action	Completed	In buffer area only
New Lenton Coal Project, 65kms north of Moranbah, QLD	2020/8778	Controlled Action	Assessment Approach	In buffer area only
Red Hill Mining Project,20kms north of Moranbah, Qld	2013/6865	Controlled Action	Post-Approval	In buffer area only
Wollombi Open Cut Coal Mine (Suttor Creek ML4761 Extension)	2005/2015	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Construction of Burdekin Pipeline	2005/2209	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Mining exploration on Wards Well West Project, Bowen Basin, Qld	2014/7256	Not Controlled Action	Completed	In buffer area only
North Goonyella Coal Co-disposal Facility	2008/4570	Not Controlled Action	Completed	In buffer area only
Rail link in central Qld	2005/2170	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
BHP Mitsui Coal???s Wards Well Exploration Program, QLD	2011/5820	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Queensland status: All
Records: All
Date: All
Latitude: -21.6442
Longitude: 147.9172
Distance: 20
Email: ajensen@emmconsulting.com.au
Date submitted: Thursday 05 May 2022 11:55:47
Date extracted: Thursday 05 May 2022 12:00:09

The number of records retrieved = 593

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			32
animals	amphibians	Hylidae	*Cyclorana alboguttata*	greenstripe frog		C		21
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		2
animals	amphibians	Hylidae	*Cyclorana cultripes*	grassland collared frog		C		3
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		32
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		99
animals	amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog		C		1
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		4
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		9
animals	amphibians	Limnodynastidae	*Limnodynastes salmini*	salmon striped frog		C		1
animals	amphibians	Limnodynastidae	*Limnodynastes tasmaniensis*	spotted grassfrog		C		13
animals	amphibians	Limnodynastidae	*Limnodynastes terraereginae*	scarlet sided pobblebonk		C		5
animals	amphibians	Limnodynastidae	*Notaden bennettii*	holy cross frog		C		1
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		44
animals	amphibians	Myobatrachidae	*Uperoleia sp.*			C		1
animals	birds	Acanthizidae	*Acanthiza apicalis*	inland thornbill		C		4
animals	birds	Acanthizidae	*Acanthiza pusilla*	brown thornbill		C		1
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		7
animals	birds	Acanthizidae	*Gerygone fusca*	western gerygone		C		1
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		12
animals	birds	Acanthizidae	*Pyrrholaemus sagittatus*	speckled warbler		C		11
animals	birds	Acanthizidae	*Sericornis frontalis*	white-browed scrubwren		C		3
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		92
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		3
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		6
animals	birds	Accipitridae	*Elanus axillaris*	black-shouldered kite		C		2
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		16
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		3
animals	birds	Alaudidae	*Mirafra javanica*	Horsfield's bushlark		C		1
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		3
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		5
animals	birds	Anatidae	*Aythya australis*	hardhead		C		5
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		3
animals	birds	Anatidae	*Dendrocygna arcuata*	wandering whistling-duck		C		1
animals	birds	Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		C		1
animals	birds	Anatidae	*Nettapus coromandelianus*	cotton pygmy-goose		C		3
animals	birds	Anatidae	*Spatula rhynchotis*	Australasian shoveler		C		1
animals	birds	Ardeidae	*Ardea alba modesta*	eastern great egret		C		4
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		2
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		3
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		2
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		3
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		1
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		79
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		63
animals	birds	Artamidae	*Gymnorhina tibicen*	Australian magpie		C		56

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		47
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		41
animals	birds	Cacatuidae	*Eolophus roseicapilla*	galah		C		17
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		44
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		7
animals	birds	Campephagidae	*Edolisoma tenuirostre*	common cicadabird		C		27
animals	birds	Campephagidae	*Lalage tricolor*	white-winged triller		C		11
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		8
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		1
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		C		2
animals	birds	Cisticolidae	*Cisticola exilis*	golden-headed cisticola		C		7
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		4
animals	birds	Columbidae	*Geopelia placida*	peaceful dove		C		17
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	12
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		6
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		38
animals	birds	Corcoracidae	*Corcorax melanorhamphos*	white-winged chough		C		2
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		16
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		118
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		C		4
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		3
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		2
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		19
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		4
animals	birds	Cuculidae	*Chalcites lucidus*	shining bronze-cuckoo		C		6
animals	birds	Cuculidae	*Chalcites osculans*	black-eared cuckoo		C		1
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		5
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		C		7
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo		C		15
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		22
animals	birds	Eurostopodidae	*Eurostopodus mystacalis*	white-throated nightjar		C		3
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		4
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		11
animals	birds	Gruidae	*Antigone rubicunda*	brolga		C		7
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		11
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		40
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		5
animals	birds	Halcyonidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		C		2
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		11
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow		C		2
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		6
animals	birds	Jacanidae	*Irediparra gallinacea*	comb-crested jacana		C		1
animals	birds	Maluridae	*Malurus assimilis*	purple-backed fairy-wren		C		18
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		38
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		4
animals	birds	Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		48
animals	birds	Meliphagidae	*Gavicalis virescens*	singing honeyeater		C		24
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		14
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		18
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		10
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		19
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		58
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		48
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		63
animals	birds	Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		C		13
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		48
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		19
animals	birds	Monarchidae	*Monarcha melanopsis*	black-faced monarch		SL		1
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		17
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		46
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		12
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		10
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		10
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		7
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		32
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		15/1
animals	birds	Pardalotidae	*Pardalotus punctatus*	spotted pardalote		C		1
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		58
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		3
animals	birds	Petroicidae	*Petroica goodenovii*	red-capped robin		C		1
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		2
animals	birds	Phasianidae	*Coturnix pectoralis*	stubble quail		C		1
animals	birds	Phasianidae	*Coturnix sp.*			C		1
animals	birds	Phasianidae	*Synoicus ypsilophorus*	brown quail		C		2
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		4
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		4
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		20
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		27
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		45
animals	birds	Psittacidae	*Trichoglossus moluccanus*	rainbow lorikeet		C		36
animals	birds	Ptilonorhynchidae	*Chlamydera maculata*	spotted bowerbird		C		5
animals	birds	Rallidae	*Fulica atra*	Eurasian coot		C		3
animals	birds	Rallidae	*Gallinula tenebrosa*	dusky moorhen		C		3
animals	birds	Rallidae	*Porphyrio melanotus*	purple swamphen		C		1
animals	birds	Recurvirostridae	*Himantopus himantopus*	black-winged stilt		C		2
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		6
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		9
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		7
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		2
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		1

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animals	birds	Turnicidae	*Turnix maculosus*	red-backed button-quail		C		2
animals	birds	Turnicidae	*Turnix varius*	painted button-quail		C		2
animals	birds	Tytonidae	*Tyto javanica*	eastern barn owl		C		1
animals	mammals	Canidae	*Canis sp.*		Y			15
animals	mammals	Dasyuridae	*Planigale ingrami*	long-tailed planigale		C		3
animals	mammals	Dasyuridae	*Planigale maculata*	common planigale		C		3
animals	mammals	Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		C		20
animals	mammals	Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheathtail bat		C		4
animals	mammals	Emballonuridae	*Taphozous troughtoni*	Troughton's sheathtail bat		C		2
animals	mammals	Felidae	*Felis catus*	cat	Y			7
animals	mammals	Leporidae	*Oryctolagus cuniculus*	rabbit	Y			8
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		20
animals	mammals	Macropodidae	*Notamacropus agilis*	agile wallaby		C		1
animals	mammals	Macropodidae	*Osphranter robustus*	common wallaroo		C		5
animals	mammals	Macropodidae	*Osphranter rufus*	red kangaroo		C		1
animals	mammals	Macropodidae	*Petrogale herberti*	Herbert's rock-wallaby		C		3
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby		C		4
animals	mammals	Miniopteridae	*Miniopterus schreibersii oceanensis*	eastern bent-wing bat		C		2
animals	mammals	Molossidae	*Chaerephon jobensis*	northern freetail bat		C		3
animals	mammals	Molossidae	*Mormopterus lumsdenae*	northern free-tailed bat		C		3
animals	mammals	Molossidae	*Mormopterus ridei*	eastern free-tailed bat		C		2
animals	mammals	Muridae	*Hydromys chrysogaster*	water rat		C		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			8
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		6
animals	mammals	Muridae	*Pseudomys sp.*			C		1
animals	mammals	Muridae	*Rattus fuscipes*	bush rat		C		1
animals	mammals	Muridae	*Rattus tunneyi*	pale field-rat		C		5
animals	mammals	Petauridae	*Petaurus notatus*	Krefft's glider		C		2
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		5
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		5
animals	mammals	Pseudocheiridae	*Petauroides armillatus*	central greater glider		E	V	7
animals	mammals	Suidae	*Sus scrofa*	pig	Y			2
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		SL		7
animals	mammals	Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		C		7
animals	mammals	Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		C		3
animals	mammals	Vespertilionidae	*Chalinolobus nigrogriseus*	hoary wattled bat		C		4
animals	mammals	Vespertilionidae	*Chalinolobus picatus*	little pied bat		C		2
animals	mammals	Vespertilionidae	*Chalinolobus sp.*			C		8
animals	mammals	Vespertilionidae	*Nyctophilus gouldi*	Gould's long-eared bat		C		5
animals	mammals	Vespertilionidae	*Nyctophilus sp.*			C		3
animals	mammals	Vespertilionidae	*Scotorepens balstoni*	inland broad-nosed bat		C		2
animals	mammals	Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		C		7
animals	mammals	Vespertilionidae	*Scotorepens sp.*			C		2
animals	mammals	Vespertilionidae	*Vespadelus baverstocki*	inland forest bat		C		4
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		6
animals	reptiles	Agamidae	*Amphibolurus burnsi*	Burns's dragon		C		2

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animals	reptiles	Agamidae	*Chlamydosaurus kingii*	frilled lizard		C		2
animals	reptiles	Agamidae	*Diporiphora australis*	tommy roundhead		C		4
animals	reptiles	Agamidae	*Diporiphora nobbi*	nobbi		C		2
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		32
animals	reptiles	Boidae	*Antaresia maculosa*	spotted python		C		29
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		5
animals	reptiles	Carphodactylidae	*Nephrurus asper*	spiny knob-tailed gecko		C		12
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		2
animals	reptiles	Colubridae	*Dendrelaphis punctulatus*	green tree snake		C		6
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		1
animals	reptiles	Diplodactylidae	*Diplodactylus platyurus*	eastern fat-tailed gecko		C		22
animals	reptiles	Diplodactylidae	*Diplodactylus vittatus*	wood gecko		C		10
animals	reptiles	Diplodactylidae	*Lucasium steindachneri*	Steindachner's gecko		C		26
animals	reptiles	Diplodactylidae	*Oedura monilis*	ocellated velvet gecko		C		14
animals	reptiles	Diplodactylidae	*Oedura monilis sensu lato*	ocellated velvet gecko		C		17
animals	reptiles	Diplodactylidae	*Strophurus williamsi*	soft-spined gecko		C		41
animals	reptiles	Elapidae	*Brachyurophis australis*	coral snake		C		11
animals	reptiles	Elapidae	*Cryptophis boschmai*	Carpentaria whip snake		C		27
animals	reptiles	Elapidae	*Demansia psammophis*	yellow-faced whipsnake		C		22
animals	reptiles	Elapidae	*Demansia torquata*	collared whipsnake		C		1
animals	reptiles	Elapidae	*Denisonia maculata*	ornamental snake		V	V	66
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		4
animals	reptiles	Elapidae	*Hoplocephalus bitorquatus*	pale-headed snake		C		8
animals	reptiles	Elapidae	*Pseudonaja textilis*	eastern brown snake		C		17
animals	reptiles	Elapidae	*Suta suta*	myall snake		C		26
animals	reptiles	Elapidae	*Vermicella annulata*	bandy-bandy		C		5
animals	reptiles	Gekkonidae	*Gehyra catenata*	chain-backed dtella		C		13
animals	reptiles	Gekkonidae	*Gehyra dubia*	dubious dtella		C		61
animals	reptiles	Gekkonidae	*Gehyra versicolor*			C		4
animals	reptiles	Gekkonidae	*Hemidactylus frenatus*	house gecko	Y			1
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		77
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		64
animals	reptiles	Pygopodidae	*Paradelma orientalis*	brigalow scaly-foot		C		7
animals	reptiles	Pygopodidae	*Pygopus schraderi*	eastern hooded scaly-foot		C		6
animals	reptiles	Scincidae	*Carlia munda*	shaded-litter rainbow-skink		C		3
animals	reptiles	Scincidae	*Carlia rubigo*	orange-flanked rainbow skink		C		95
animals	reptiles	Scincidae	*Carlia schmeltzii*	robust rainbow-skink		C		7
animals	reptiles	Scincidae	*Carlia vivax*	tussock rainbow-skink		C		8
animals	reptiles	Scincidae	*Cryptoblepharus pulcher pulcher*	elegant snake-eyed skink		C		19
animals	reptiles	Scincidae	*Ctenotus allotropis*	brown-blazed wedgesnout ctenotus		C		1
animals	reptiles	Scincidae	*Ctenotus ingrami*	unspotted yellow-sided ctenotus		C		15
animals	reptiles	Scincidae	*Ctenotus spaldingi*	straight-browed ctenotus		C		22
animals	reptiles	Scincidae	*Ctenotus strauchii*	eastern barred wedgesnout ctenotus		C		2
animals	reptiles	Scincidae	*Ctenotus taeniolatus*	copper-tailed skink		C		7
animals	reptiles	Scincidae	*Eremiascincus fasciolatus*	narrow-banded sand swimmer		C		1
animals	reptiles	Scincidae	*Glaphyromorphus punctulatus*	fine-spotted mulch-skink		C		1

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animals	reptiles	Scincidae	*Lerista fragilis*	eastern mulch slider		C		8
animals	reptiles	Scincidae	*Lerista punctatovittata*	eastern robust slider		C		1
animals	reptiles	Scincidae	*Lerista sp.*			C		1
animals	reptiles	Scincidae	*Liburnascincus mundivensis*	outcrop rainbow-skink		C		1
animals	reptiles	Scincidae	*Lygisaurus foliorum*	tree-base litter-skink		C		54
animals	reptiles	Scincidae	*Menetia greyii*	common dwarf skink		C		17
animals	reptiles	Scincidae	*Morethia boulengeri*	south-eastern morethia skink		C		46
animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		3
animals	reptiles	Scincidae	*Praeteropus brevicollis*	short-necked worm-skink		C		1
animals	reptiles	Scincidae	*Pygmaeascincus timlowi*	dwarf litter-skink		C		8
animals	reptiles	Typhlopidae	*Anilios ligatus*	robust blind snake		C		11
animals	reptiles	Typhlopidae	*Anilios unguirostris*	claw-snouted blind snake		C		1
animals	reptiles	Varanidae	*Varanus tristis*	black-tailed monitor		C		1
fungi	lecanoromycetes	Caliciaceae	*Pyxine australiensis*			C		1/1
fungi	lecanoromycetes	Parmeliaceae	*Parmotrema austrosinense*			C		1/1
fungi	lecanoromycetes	Physciaceae	*Physcia stellaris*			C		1/1
fungi	lecanoromycetes	Ramalinaceae	*Ramalina inflata*			C		1/1
fungi	lecanoromycetes	Ramalinaceae	*Ramalina subfraxinea*			C		1/1
plants	land plants	Acanthaceae	*Harnieria sp. (Lornesleigh E.J.Thompson+ CHA75)*			C		1/1
plants	land plants	Acanthaceae	*Rostellularia adscendens*			C		3/2
plants	land plants	Amaranthaceae	*Alternanthera nodiflora*	joyweed		C		1
plants	land plants	Amaranthaceae	*Gomphrena celosioides*	gomphrena weed	Y			1
plants	land plants	Amaranthaceae	*Gomphrena lanata*			C		1/1
plants	land plants	Amaranthaceae	*Ptilotus fusiformis*			C		1/1
plants	land plants	Amaranthaceae	*Ptilotus polystachyus*			C		3/3
plants	land plants	Amaranthaceae	*Ptilotus uncinellus*			E		1/1
plants	land plants	Apiaceae	*Daucus glochidiatus*	Australian carrot		C		1/1
plants	land plants	Apocynaceae	*Alstonia constricta*	bitterbark		C		1
plants	land plants	Apocynaceae	*Asclepias curassavica*	red-head cottonbush	Y			1
plants	land plants	Apocynaceae	*Carissa lanceolata*			C		1
plants	land plants	Apocynaceae	*Carissa ovata*	currantbush		C		2
plants	land plants	Apocynaceae	*Cerbera dumicola*			NT		2/1
plants	land plants	Apocynaceae	*Cynanchum pedunculatum*			C		1/1
plants	land plants	Apocynaceae	*Leichhardtia microlepis*			C		1
plants	land plants	Apocynaceae	*Leichhardtia viridiflora subsp. viridiflora*			C		1/1
plants	land plants	Apocynaceae	*Parsonsia lanceolata*	northern silkpod		C		1/1
plants	land plants	Apocynaceae	*Parsonsia straminea*	monkey rope		C		1
plants	land plants	Asphodelaceae	*Bulbine fraseri*			C		1/1
plants	land plants	Asteraceae	*Ageratum houstonianum*	blue billygoat weed	Y			1
plants	land plants	Asteraceae	*Apowollastonia spilanthoides*			C		1/1
plants	land plants	Asteraceae	*Bidens bipinnata*	bipinnate beggar's ticks	Y			1
plants	land plants	Asteraceae	*Calotis cuneata*			C		1/1
plants	land plants	Asteraceae	*Calotis cuneifolia*	burr daisy		C		3/2
plants	land plants	Asteraceae	*Cyanthillium cinereum*			C		2
plants	land plants	Asteraceae	*Emilia sonchifolia*		Y			1
plants	land plants	Asteraceae	*Euchiton sphaericus*			C		2/2

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plants	land plants	Asteraceae	*Flaveria trinervia*		Y			1/1
plants	land plants	Asteraceae	*Parthenium hysterophorus*	parthenium weed	Y			2
plants	land plants	Asteraceae	*Pterocaulon redolens*			C		1
plants	land plants	Asteraceae	*Rutidosis leucantha*			C		1/1
plants	land plants	Asteraceae	*Symphyotrichum subulatum*		Y			1
plants	land plants	Asteraceae	*Xanthium occidentale*		Y			1
plants	land plants	Bignoniaceae	*Pandorea pandorana*	wonga vine		C		2/1
plants	land plants	Boraginaceae	*Ehretia membranifolia*	weeping koda		C		2/1
plants	land plants	Boraginaceae	*Heliotropium geocharis*			C		2/2
plants	land plants	Boraginaceae	*Heliotropium peninsulare*			C		1/1
plants	land plants	Boraginaceae	*Trichodesma zeylanicum*			C		1/1
plants	land plants	Boraginaceae	*Trichodesma zeylanicum var. latisepaleum*			C		1/1
plants	land plants	Byttneriaceae	*Waltheria indica*			C		2/2
plants	land plants	Cactaceae	*Harrisia martinii*		Y			1
plants	land plants	Cactaceae	*Opuntia*					1
plants	land plants	Cactaceae	*Opuntia stricta*		Y			2
plants	land plants	Campanulaceae	*Lobelia concolor*			SL		1/1
plants	land plants	Campanulaceae	*Lobelia leucotos*			SL		2/1
plants	land plants	Campanulaceae	*Lobelia purpurascens*	white root		SL		1
plants	land plants	Campanulaceae	*Wahlenbergia*					1
plants	land plants	Campanulaceae	*Wahlenbergia gracilis*	sprawling bluebell		SL		1/1
plants	land plants	Capparaceae	*Capparis anomala*			C		1
plants	land plants	Capparaceae	*Capparis canescens*			C		1
plants	land plants	Capparaceae	*Capparis lasiantha*	nipan		C		2/1
plants	land plants	Capparaceae	*Capparis shanesiana*			C		1/1
plants	land plants	Caryophyllaceae	*Polycarpaea corymbosa var. minor*			C		1/1
plants	land plants	Casuarinaceae	*Casuarina cristata*	belah		C		1/1
plants	land plants	Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*			C		1
plants	land plants	Celastraceae	*Denhamia cunninghamii*			C		1
plants	land plants	Celastraceae	*Elaeodendron australe*			C		1
plants	land plants	Celastraceae	*Elaeodendron australe var. integrifolium*			C		1/1
plants	land plants	Chenopodiaceae	*Maireana villosa*			C		1/1
plants	land plants	Chenopodiaceae	*Salsola australis*			C		1
plants	land plants	Combretaceae	*Terminalia oblongata subsp. oblongata*			C		3/1
plants	land plants	Commelinaceae	*Commelina*					1
plants	land plants	Commelinaceae	*Commelina ensifolia*	scurvy grass		C		1/1
plants	land plants	Convolvulaceae	*Evolvulus alsinoides var. decumbens*			C		1
plants	land plants	Convolvulaceae	*Ipomoea lonchophylla*			C		1/1
plants	land plants	Convolvulaceae	*Ipomoea plebeia*	bellvine		C		1
plants	land plants	Convolvulaceae	*Polymeria pusilla*			C		1/1
plants	land plants	Cyperaceae	*Cyperus betchei subsp. betchei*			C		1/1
plants	land plants	Cyperaceae	*Cyperus bifax*	western nutgrass		C		1/1
plants	land plants	Cyperaceae	*Cyperus dactylotes*			C		1/1
plants	land plants	Cyperaceae	*Cyperus exaltatus*	tall flatsedge		C		1
plants	land plants	Cyperaceae	*Cyperus fulvus*			C		1
plants	land plants	Cyperaceae	*Cyperus gilesii*			C		1

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plants	land plants	Cyperaceae	*Cyperus gracilis*			C		1
plants	land plants	Cyperaceae	*Cyperus rigidellus*			C		1
plants	land plants	Cyperaceae	*Cyperus rotundus*	nutgrass	Y			1
plants	land plants	Cyperaceae	*Eleocharis philippinensis*			C		1/1
plants	land plants	Cyperaceae	*Fimbristylis depauperata*			C		2/2
plants	land plants	Ebenaceae	*Diospyros humilis*	small-leaved ebony		C		1
plants	land plants	Elatinaceae	*Bergia trimera*			C		1/1
plants	land plants	Erythroxylaceae	*Erythroxylum australe*	cocaine tree		C		2
plants	land plants	Euphorbiaceae	*Acalypha eremorum*	soft acalypha		C		3/1
plants	land plants	Euphorbiaceae	*Adriana tomentosa var. tomentosa*			C		2/2
plants	land plants	Euphorbiaceae	*Bertya opponens*			C	V	1/1
plants	land plants	Euphorbiaceae	*Croton insularis*	Queensland cascarilla		C		2
plants	land plants	Euphorbiaceae	*Croton phebalioides*	narrow-leaved croton		C		2
plants	land plants	Euphorbiaceae	*Euphorbia coghlanii*			C		2/2
plants	land plants	Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*			C		1/1
plants	land plants	Euphorbiaceae	*Ricinocarpos ledifolius*	scrub wedding bush		C		1/1
plants	land plants	Goodeniaceae	*Goodenia glabra*			C		1/1
plants	land plants	Goodeniaceae	*Goodenia grandiflora*			C		1/1
plants	land plants	Goodeniaceae	*Goodenia hirsuta*			C		1/1
plants	land plants	Haloragaceae	*Haloragis stricta*			C		2/2
plants	land plants	Hypoxidaceae	*Hypoxis arillacea*			C		1/1
plants	land plants	Johnsoniaceae	*Tricoryne elatior*	yellow autumn lily		C		1/1
plants	land plants	Juncaceae	*Juncus usitatus*			C		2
plants	land plants	Lamiaceae	*Basilicum polystachyon*			C		1
plants	land plants	Lamiaceae	*Clerodendrum floribundum*			C		2
plants	land plants	Lamiaceae	*Teucrium junceum*			C		1
plants	land plants	Laxmanniaceae	*Eustrephus latifolius*	wombat berry		C		1
plants	land plants	Laxmanniaceae	*Lomandra confertifolia subsp. pallida*			C		1
plants	land plants	Laxmanniaceae	*Lomandra longifolia*			C		1
plants	land plants	Laxmanniaceae	*Lomandra multiflora subsp. multiflora*			C		1
plants	land plants	Lecythidaceae	*Planchonia careya*	cockatoo apple		C		1
plants	land plants	Leguminosae	*Acacia*					1
plants	land plants	Leguminosae	*Acacia burdekensis*			C		1/1
plants	land plants	Leguminosae	*Acacia catenulata*	bendee		C		2/1
plants	land plants	Leguminosae	*Acacia conferta*			C		1/1
plants	land plants	Leguminosae	*Acacia crassa subsp. crassa*			C		1
plants	land plants	Leguminosae	*Acacia excelsa*			C		2
plants	land plants	Leguminosae	*Acacia fodinalis*			C		1/1
plants	land plants	Leguminosae	*Acacia harpophylla*	brigalow		C		3
plants	land plants	Leguminosae	*Acacia leiocalyx subsp. leiocalyx*			C		2
plants	land plants	Leguminosae	*Acacia oswaldii*	miljee		C		3/2
plants	land plants	Leguminosae	*Acacia salicina*	doolan		C		2/1
plants	land plants	Leguminosae	*Acacia shirleyi*	lancewood		C		2/1
plants	land plants	Leguminosae	*Acacia sparsiflora*			C		1/1
plants	land plants	Leguminosae	*Alysicarpus muelleri*			C		3/3
plants	land plants	Leguminosae	*Archidendropsis basaltica*	red lancewood		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Leguminosae	*Bossiaea carinalis*			C		1/1
plants	land plants	Leguminosae	*Cassia brewsteri*			C		3/1
plants	land plants	Leguminosae	*Clitoria ternatea*	butterfly pea	Y			1
plants	land plants	Leguminosae	*Crotalaria juncea*	sunhemp	Y			1/1
plants	land plants	Leguminosae	*Crotalaria medicaginea*	trefoil rattlepod		C		1
plants	land plants	Leguminosae	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			C		1
plants	land plants	Leguminosae	*Cullen tenax*	emu-foot		C		1/1
plants	land plants	Leguminosae	*Desmodium campylocaulon*			C		2/1
plants	land plants	Leguminosae	*Desmodium macrocarpum*			C		1/1
plants	land plants	Leguminosae	*Glycine falcata*			C		1/1
plants	land plants	Leguminosae	*Glycine tomentella*	woolly glycine		C		1
plants	land plants	Leguminosae	*Hardenbergia perbrevidens*			C		1/1
plants	land plants	Leguminosae	*Hardenbergia violacea*			C		1/1
plants	land plants	Leguminosae	*Hovea longipes*	brush hovea		C		2/1
plants	land plants	Leguminosae	*Lysiphyllum*					1
plants	land plants	Leguminosae	*Lysiphyllum carronii*	ebony tree		C		2
plants	land plants	Leguminosae	*Lysiphyllum hookeri*	Queensland ebony		C		3/1
plants	land plants	Leguminosae	*Macroptilium lathyroides var. semierectum*		Y			1
plants	land plants	Leguminosae	*Neptunia gracilis forma gracilis*			C		1
plants	land plants	Leguminosae	*Neptunia monosperma*			C		1/1
plants	land plants	Leguminosae	*Prosopis pallida*		Y			1/1
plants	land plants	Leguminosae	*Rhynchosia minima*			C		2
plants	land plants	Leguminosae	*Sesbania cannabina*			C		1
plants	land plants	Leguminosae	*Sesbania cannabina var. cannabina*			C		1
plants	land plants	Leguminosae	*Stylosanthes*					1
plants	land plants	Leguminosae	*Vigna radiata var. sublobata*			C		1/1
plants	land plants	Leguminosae	*Zornia muriculata subsp. angustata*			C		1/1
plants	land plants	Loranthaceae	*Amyema quandang var. bancroftii*	broad-leaved grey mistletoe		C		1/1
plants	land plants	Loranthaceae	*Lysiana subfalcata*			C		1/1
plants	land plants	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		1
plants	land plants	Malvaceae	*Gossypium sturtianum*			C		1
plants	land plants	Malvaceae	*Hibiscus sturtii*			C		1
plants	land plants	Malvaceae	*Hibiscus sturtii var. sturtii*			C		2/2
plants	land plants	Malvaceae	*Sida atherophora*			C		2/1
plants	land plants	Malvaceae	*Sida brachypoda*			C		1/1
plants	land plants	Malvaceae	*Sida cordifolia*		Y			2
plants	land plants	Malvaceae	*Sida filiformis - S.macropoda*			C		1
plants	land plants	Malvaceae	*Sida hackettiana*			C		1
plants	land plants	Malvaceae	*Sida laevis*			C		1/1
plants	land plants	Malvaceae	*Sida rhombifolia*		Y			2
plants	land plants	Malvaceae	*Sida sp. (Aramac E.J.Thompson+ JER192)*			C		1/1
plants	land plants	Malvaceae	*Sida spinosa*	spiny sida	Y			2
plants	land plants	Malvaceae	*Sida trichopoda*			C		1
plants	land plants	Marsileaceae	*Marsilea exarata*	sway-back nardoo		C		1/1
plants	land plants	Meliaceae	*Owenia acidula*	emu apple		C		1
plants	land plants	Menispermaceae	*Tinospora smilacina*	snakevine		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Molluginaceae	*Glinus lotoides*	hairy carpet weed		C		1/1
plants	land plants	Myrtaceae	*Calytrix tetragona*	fringe myrtle		C		1/1
plants	land plants	Myrtaceae	*Corymbia clarksoniana*			C		4/2
plants	land plants	Myrtaceae	*Corymbia dallachiana*			C		1
plants	land plants	Myrtaceae	*Corymbia tessellaris*	Moreton Bay ash		C		2
plants	land plants	Myrtaceae	*Eucalyptus*					2
plants	land plants	Myrtaceae	*Eucalyptus brownii*	Reid River box		C		2
plants	land plants	Myrtaceae	*Eucalyptus camaldulensis subsp. acuta*			C		2
plants	land plants	Myrtaceae	*Eucalyptus cambageana*	Dawson gum		C		3/2
plants	land plants	Myrtaceae	*Eucalyptus crebra*	narrow-leaved red ironbark		C		1
plants	land plants	Myrtaceae	*Eucalyptus drepanophylla*			C		1
plants	land plants	Myrtaceae	*Eucalyptus exserta*	Queensland peppermint		C		2
plants	land plants	Myrtaceae	*Eucalyptus persistens*			C		1
plants	land plants	Myrtaceae	*Eucalyptus populnea*	poplar box		C		2
plants	land plants	Myrtaceae	*Eucalyptus tereticornis subsp. tereticornis*			C		3/1
plants	land plants	Myrtaceae	*Eucalyptus thozetiana*			C		1
plants	land plants	Myrtaceae	*Melaleuca bracteata*			C		1/1
plants	land plants	Myrtaceae	*Melaleuca pallescens*			C		1/1
plants	land plants	Myrtaceae	*Thryptomene parviflora*			C		1/1
plants	land plants	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		1
plants	land plants	Oxalidaceae	*Oxalis chnoodes*			C		2/2
plants	land plants	Phyllanthaceae	*Breynia oblongifolia*			C		1
plants	land plants	Phyllanthaceae	*Flueggea leucopyrus*			C		1
plants	land plants	Phyllanthaceae	*Phyllanthus*					1/1
plants	land plants	Phyllanthaceae	*Phyllanthus hebecarpus*			C		1/1
plants	land plants	Picrodendraceae	*Petalostigma pubescens*	quinine tree		C		2
plants	land plants	Pittosporaceae	*Bursaria incana*			C		1
plants	land plants	Pittosporaceae	*Pittosporum angustifolium*			C		1
plants	land plants	Pittosporaceae	*Pittosporum spinescens*			C		1
plants	land plants	Plantaginaceae	*Scoparia dulcis*	scoparia	Y			2
plants	land plants	Poaceae	*Alloteropsis cimicina*			C		2/2
plants	land plants	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		1/1
plants	land plants	Poaceae	*Ancistrachne uncinulata*	hooky grass		C		1
plants	land plants	Poaceae	*Aristida benthamii var. benthamii*			C		1/1
plants	land plants	Poaceae	*Aristida calycina*			C		2
plants	land plants	Poaceae	*Aristida calycina var. calycina*			C		1/1
plants	land plants	Poaceae	*Aristida caput-medusae*			C		1
plants	land plants	Poaceae	*Aristida holathera var. holathera*			C		1/1
plants	land plants	Poaceae	*Aristida hygrometrica*			C		1/1
plants	land plants	Poaceae	*Aristida jerichoensis var. subspinulifera*			C		1/1
plants	land plants	Poaceae	*Aristida leptopoda*	white speargrass		C		1/1
plants	land plants	Poaceae	*Aristida lignosa*			C		1
plants	land plants	Poaceae	*Aristida personata*			C		1
plants	land plants	Poaceae	*Arundinella nepalensis*	reedgrass		C		1/1
plants	land plants	Poaceae	*Astrebla elymoides*	hoop mitchell grass		C		1/1
plants	land plants	Poaceae	*Astrebla lappacea*	curly mitchell grass		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Poaceae	*Bothriochloa*					1
plants	land plants	Poaceae	*Bothriochloa bladhii*			C		1
plants	land plants	Poaceae	*Bothriochloa decipiens var. cloncurrensis*			C		1
plants	land plants	Poaceae	*Bothriochloa decipiens var. decipiens*			C		1
plants	land plants	Poaceae	*Bothriochloa erianthoides*	satintop grass		C		3/3
plants	land plants	Poaceae	*Bothriochloa ewartiana*	desert bluegrass		C		2/1
plants	land plants	Poaceae	*Bothriochloa pertusa*		Y			1
plants	land plants	Poaceae	*Brachyachne convergens*	common native couch		C		1/1
plants	land plants	Poaceae	*Calyptochloa gracillima subsp. gracillima*			C		2
plants	land plants	Poaceae	*Cenchrus ciliaris*		Y			3
plants	land plants	Poaceae	*Chionachne hubbardiana*			C		1/1
plants	land plants	Poaceae	*Chloris gayana*	rhodes grass	Y			1
plants	land plants	Poaceae	*Chloris virgata*	feathertop rhodes grass	Y			2
plants	land plants	Poaceae	*Cleistochloa subjuncea*			C		2/1
plants	land plants	Poaceae	*Cymbopogon bombycinus*	silky oilgrass		C		1/1
plants	land plants	Poaceae	*Cymbopogon refractus*	barbed-wire grass		C		2
plants	land plants	Poaceae	*Cynodon dactylon var. dactylon*		Y			2
plants	land plants	Poaceae	*Dichanthium*					10/10
plants	land plants	Poaceae	*Dichanthium annulatum*	sheda grass	Y			2/1
plants	land plants	Poaceae	*Dichanthium aristatum*	angleton grass	Y			1
plants	land plants	Poaceae	*Dichanthium fecundum*	curly bluegrass		C		1/1
plants	land plants	Poaceae	*Dichanthium queenslandicum*			V	E	26/26
plants	land plants	Poaceae	*Dichanthium sericeum*			C		7/6
plants	land plants	Poaceae	*Dichanthium sericeum subsp. humilius*			C		1/1
plants	land plants	Poaceae	*Dichanthium sericeum subsp. sericeum*			C		3/3
plants	land plants	Poaceae	*Digitaria ammophila*	silky umbrella grass		C		4/3
plants	land plants	Poaceae	*Digitaria bicornis*			C		1/1
plants	land plants	Poaceae	*Digitaria brownii*			C		2/2
plants	land plants	Poaceae	*Digitaria ciliaris*	summer grass	Y			1
plants	land plants	Poaceae	*Digitaria divaricatissima*	spreading umbrella grass		C		1/1
plants	land plants	Poaceae	*Digitaria fumida*			C		1/1
plants	land plants	Poaceae	*Digitaria minima*			C		1
plants	land plants	Poaceae	*Digitaria porrecta*			NT		4/4
plants	land plants	Poaceae	*Dinebra decipiens*			C		1
plants	land plants	Poaceae	*Dinebra ligulata*			C		2/2
plants	land plants	Poaceae	*Echinochloa colona*	awnless barnyard grass	Y			1
plants	land plants	Poaceae	*Elionurus citreus*	lemon-scented grass		C		1/1
plants	land plants	Poaceae	*Enneapogon lindleyanus*			C		1
plants	land plants	Poaceae	*Enneapogon robustissimus*			C		1/1
plants	land plants	Poaceae	*Enneapogon truncatus*			C		1/1
plants	land plants	Poaceae	*Enteropogon ramosus*			C		1
plants	land plants	Poaceae	*Eragrostis elongata*			C		2
plants	land plants	Poaceae	*Eragrostis lacunaria*	purple lovegrass		C		2/1
plants	land plants	Poaceae	*Eragrostis parviflora*	weeping lovegrass		C		2/2
plants	land plants	Poaceae	*Eragrostis sororia*			C		2/2
plants	land plants	Poaceae	*Eragrostis tenellula*	delicate lovegrass		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Poaceae	*Eriachne ciliata*			C		1/1
plants	land plants	Poaceae	*Eriachne mucronata forma (Alpha C.E.Hubbard 7882)*			C		2/2
plants	land plants	Poaceae	*Eriachne obtusa*			C		1/1
plants	land plants	Poaceae	*Eriachne pallescens*			C		1/1
plants	land plants	Poaceae	*Eriochloa crebra*	spring grass		C		1/1
plants	land plants	Poaceae	*Eriochloa procera*	slender cupgrass		C		2/1
plants	land plants	Poaceae	*Eriochloa pseudoacrotricha*			C		1/1
plants	land plants	Poaceae	*Eulalia aurea*	silky browntop		C		2/1
plants	land plants	Poaceae	*Heteropogon contortus*	black speargrass		C		2
plants	land plants	Poaceae	*Heteropogon triticeus*	giant speargrass		C		1
plants	land plants	Poaceae	*Hyparrhenia rufa subsp. rufa*		Y			1/1
plants	land plants	Poaceae	*Iseilema vaginiflorum*	red flinders grass		C		1/1
plants	land plants	Poaceae	*Leptochloa digitata*			C		1
plants	land plants	Poaceae	*Megathyrsus maximus var. maximus*		Y			2/1
plants	land plants	Poaceae	*Megathyrsus maximus var. pubiglumis*		Y			2
plants	land plants	Poaceae	*Melinis repens*	red natal grass	Y			2
plants	land plants	Poaceae	*Moorochloa eruciformis*		Y			1/1
plants	land plants	Poaceae	*Ophiuros exaltatus*			C		1/1
plants	land plants	Poaceae	*Panicum decompositum var. decompositum*			C		1/1
plants	land plants	Poaceae	*Panicum effusum*			C		4/3
plants	land plants	Poaceae	*Panicum queenslandicum var. queenslandicum*			C		1/1
plants	land plants	Poaceae	*Paspalidium albovillosum*			C		1
plants	land plants	Poaceae	*Paspalidium caespitosum*	brigalow grass		C		1
plants	land plants	Poaceae	*Paspalidium globoideum*	sago grass		C		3/3
plants	land plants	Poaceae	*Paspalidium gracile*	slender panic		C		1/1
plants	land plants	Poaceae	*Paspalidium rarum*			C		1/1
plants	land plants	Poaceae	*Paspalum dilatatum*	paspalum	Y			1
plants	land plants	Poaceae	*Perotis rara*	comet grass		C		1/1
plants	land plants	Poaceae	*Poaceae*					1
plants	land plants	Poaceae	*Sarga plumosum*			C		1/1
plants	land plants	Poaceae	*Setaria*					1
plants	land plants	Poaceae	*Setaria surgens*			C		1/1
plants	land plants	Poaceae	*Sorghum halepense*	Johnson grass	Y			1
plants	land plants	Poaceae	*Sporobolus australasicus*			C		2/1
plants	land plants	Poaceae	*Sporobolus caroli*	fairy grass		C		1
plants	land plants	Poaceae	*Sporobolus contiguus*			C		1/1
plants	land plants	Poaceae	*Sporobolus elongatus*			C		1
plants	land plants	Poaceae	*Sporobolus scabridus*			C		1
plants	land plants	Poaceae	*Thaumastochloa pubescens*			C		1/1
plants	land plants	Poaceae	*Thellungia advena*	coolibah grass		C		1/1
plants	land plants	Poaceae	*Themeda avenacea*			C		1
plants	land plants	Poaceae	*Themeda quadrivalvis*	grader grass	Y			1
plants	land plants	Poaceae	*Themeda triandra*	kangaroo grass		C		2
plants	land plants	Poaceae	*Thyridolepis xerophila*			C		1/1
plants	land plants	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			2/1
plants	land plants	Poaceae	*Urochloa piligera*			C		2/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Poaceae	*Walwhalleya subxerophila*			C		1/1
plants	land plants	Polygalaceae	*Polygala crassitesta*			C		3/3
plants	land plants	Proteaceae	*Hakea lorea subsp. lorea*			C		1
plants	land plants	Pteridaceae	*Cheilanthes sieberi subsp. sieberi*			C		1
plants	land plants	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		2
plants	land plants	Rhamnaceae	*Ventilago viminalis*	supplejack		C		1/1
plants	land plants	Rubiaceae	*Dolichocarpa argillacea*			C		1/1
plants	land plants	Rubiaceae	*Dolichocarpa coerulescens*			C		1/1
plants	land plants	Rubiaceae	*Everistia vacciniifolia forma crassa*			C		1/1
plants	land plants	Rubiaceae	*Everistia vacciniifolia forma vacciniifolia*			C		2
plants	land plants	Rubiaceae	*Larsenaikia ochreata*			C		1
plants	land plants	Rubiaceae	*Pavetta granitica*			C		1/1
plants	land plants	Rubiaceae	*Psydrax odorata*			C		1
plants	land plants	Rubiaceae	*Psydrax oleifolia*			C		1/1
plants	land plants	Rubiaceae	*Spermacoce*					1/1
plants	land plants	Rubiaceae	*Spermacoce sp. (Dislyn A.R.Bean 14098)*			C		2/2
plants	land plants	Rutaceae	*Citrus glauca*			C		1
plants	land plants	Rutaceae	*Flindersia australis*	crow's ash		C		1
plants	land plants	Rutaceae	*Flindersia dissosperma*			C		1
plants	land plants	Rutaceae	*Flindersia maculosa*	leopardwood		C		1
plants	land plants	Rutaceae	*Geijera parviflora*	wilga		C		1
plants	land plants	Rutaceae	*Phebalium nottii*	pink phebalium		C		2
plants	land plants	Sapindaceae	*Alectryon diversifolius*	scrub boonaree		C		2
plants	land plants	Sapindaceae	*Atalaya*					1
plants	land plants	Sapindaceae	*Atalaya hemiglauca*			C		1
plants	land plants	Sapindaceae	*Dodonaea stenophylla*			C		1/1
plants	land plants	Sapindaceae	*Dodonaea viscosa*			C		1
plants	land plants	Scrophulariaceae	*Eremophila deserti*			C		1
plants	land plants	Scrophulariaceae	*Eremophila mitchellii*			C		2
plants	land plants	Solanaceae	*Physalis pubescens*		Y			1/1
plants	land plants	Solanaceae	*Solanum*					1
plants	land plants	Solanaceae	*Solanum ellipticum*	potato bush		C		1
plants	land plants	Solanaceae	*Solanum esuriale*	quena		C		1/1
plants	land plants	Solanaceae	*Solanum parvifolium subsp. parvifolium*			C		1/1
plants	land plants	Sparrmanniaceae	*Corchorus trilocularis*			C		1/1
plants	land plants	Sparrmanniaceae	*Grewia savannicola*			C		2
plants	land plants	Thymelaeaceae	*Pimelea haematostachya*			C		2/2
plants	land plants	Verbenaceae	*Stachytarpheta jamaicensis*	Jamaica snakeweed	Y			1
plants	land plants	Verbenaceae	*Verbena macrostachya*			C		2/2
plants	land plants	Violaceae	*Pigea enneasperma*			C		1/1
plants	land plants	Violaceae	*Pigea stellarioides*			C		1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.*
The codes are Extinct (EX), Extinct in the Wild (PE), Critically Endangered (CR), Endangered (E), Vulnerable (V), Near Threatened (NT), Special Least Concern (SL) and Least Concern (C).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.*
The values of EPBC are Extinct (EX), Extinct in the Wild (XW), Critically Endangered (CE), Endangered (E), Vulnerable (V) and Conservation Dependent (CD).

Records - The first number indicates the total number of records of the taxon (wildlife records and species listings for selected areas).
This number is output as 99999 if it equals or exceeds this value. A second number located after a / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Queensland status: Rare and threatened species
Records: All
Date: All
Latitude: -21.6442
Longitude: 147.9172
Distance: 20
Email: ajensen@emmconsulting.com.au
Date submitted: Thursday 05 May 2022 12:03:43
Date extracted: Thursday 05 May 2022 12:10:03

The number of records retrieved = 7

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	12
animals	mammals	Pseudocheiridae	*Petauroides armillatus*	central greater glider		E	V	7
animals	reptiles	Elapidae	*Denisonia maculata*	ornamental snake		V	V	66
plants	land plants	Amaranthaceae	*Ptilotus uncinellus*			E		1/1
plants	land plants	Apocynaceae	*Cerbera dumicola*			NT		2/1
plants	land plants	Poaceae	*Dichanthium queenslandicum*			V	E	26/26
plants	land plants	Poaceae	*Digitaria porrecta*			NT		4/4

CODES

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This number is output as 999 if it equals or exceeds this value.

Appendix B

Curriculum Vitae

QUEENSLAND PACIFIC METALS

EMM
creating opportunities

Andrew Jensen

Associate Ecologist | Team Leader - Ecology
EMM Consulting Pty Limited

Professional Overview

Andrew has 15 years' consulting experience across a range of environmental disciplines and industries including mining, renewables, and oil and gas.

Key aspects of his work have included ecological reporting and leading field surveys, preparation of environmental impact statements, preparation of management plans, environmental offset plans, management of subcontractors and health and safety processes. Andy has also led preparation of a number of EPBC Act referrals including recently for two large wind farms.

Andrew routinely reviews environmental technical studies and has developed environmental management plans and negotiated environmental approval conditions for clients. Andrew has also been responsible for conducting a number of species impact significance assessments at both Commonwealth and state level.

Qualifications and licences

Bachelor of Science (Hons), University of St Andrews, 2003

Specialisation

Ecological assessment and reporting

Representative experience

- Specimen Hill windfarm, Ecological Surveys and EPBC referral, Biloela (Epuron)
- Boulder Creek windfarm, EPBC referral and ecological surveys, Mount Morgan (Epuron)
- Cooloola Great Walk, Review of EPBC referral, Brisbane (Queensland Parks and Wildlife Service)
- Blackwater Tailings Project, Blackwater (BHP)
- ARTC Inland Rail Project, Supplementary Fauna Surveys, Brisbane and SEQ (ARTC)
- Olive Downs Coal Mine Project, MNES surveys and monitoring, Moranbah (Pembroke Resources)
- Townsville Energy and Chemicals Hub Project, EPBC referral, Townsville (QPM)
- Queensland Coal Assets, Secondment to BHP, Brisbane (BHP)
- ARTC Inland Rail Project, Preclearance surveys for Geotechnical Program, Brisbane and SEQ (ARTC)
- Blackwater Mine Seismic Surveys, MNES Significant Impact Assessments, Brisbane (BHP)
- Mole River Dam, Ecological Constraints Report and Scoping Report, Brisbane (Water NSW)
- Carmichael Coal Mine, Secondment to Adani Mining, Brisbane (Adani Mining)
- Queensland Oil Refinery, Ecological Surveys, Gladstone (Queensland Oil Refinery)
- Mount Fox Windfarm, Ecological Constraints Report, Brisbane (Windlab)
- Blackwater Mine, Ecological Surveys, Blackwater (BHP)
- McPhillamys Gold Mine, Ecological Surveys and Biodiversity Assessment Report, Blayney NSW (Regis Resources)
- Tipton West Dalby Pipeline, Ecological Surveys, Dalby (APA Group)
- Rugby Run Solar Farm, Secondment to Adani Renewables, Brisbane/Moranbah (Adani Renewables)
- Reedy Creek Wallumbilla Pipeline, Ecological Surveys, Reedy Creek (APA Group)
- Styx Coal Mine, Supplementary Ecological Surveys, Marlborough (Waratah Coal)
- Bauxite Hills Mine, Ecological Surveys, north of Weipa (Metro Mining)
- Williamtown Airport – expansions, Newcastle (Defence Australia)
- Elk Antelope gas field, Preparation of ESIA, Papua New Guinea (Total E&P PNG Limited)
- Cape River Substation, Vegetation clearing permit, Pentland (Windlab)
- Frieda River Project, Aquatic Ecology Impact Assessment, Papua New Guinea (PanAust)
- Kennedy Energy Park, Ecological assessment and EPBC referral, Hughenden (Windlab)
- Chifley Road upgrade, Review of Environmental Factors, Chifley NSW (Roads and Maritime
- Granville Platform Upgrade, Review of Environmental Factors, Granville NSW (Sydney Trains)
- Erskineville platform upgrade, Review of Environmental Factors, Erskinville NSW (Sydney Trains)
- Menangle Park gas pipeline, Review of Environmental Factors, Menangle Park NSW (Jemena)
- Riverwood Bridge upgrade, Review of Environmental Factors, Riverwood NSW (Sydney Trains)
- P'nyang Project appraisal well, Preparation of ESIA, Papua New Guinea (Oil Search)
- P'nyang Project, Preparation of EIS, Papua New Guinea (Esso PNG P'nyang Ltd)
- Former Mary Kathleen uranium mine, Environmental Condition and Rehabilitation Assessment, near Mount Isa (Queensland Government)
- Sarsfield Gold Mine Expansion Project Supplementary Report to the EIS, Ravenswood (Carpentaria Gold)
- PNG LNG Pipeline Project, Preconstruction Environmental Surveys, Papua New Guinea (Spiecapag)

- PNG LNG Project, Secondment to ExxonMobil, Papua New Guinea (ExxonMobil)
- Moura Pipeline, Ecological Assessment and EPBC Referral, Moura (Queensland Nitrates)
- Hillalong Project, Ecological Surveys for reassignment of vegetation mapping, Glenden (Shandong Energy)
- Surat Gas Project, Supplementary Report to the EIS, Brisbane/Surat Basin (Arrow Energy)
- Arrow LNG Plant, Supplementary Report to the EIS, Brisbane/Gladstone (Arrow Energy)
- Moranbah Gas Project, Threatened Species Management Plan, Brisbane (Arrow Energy)
- Arrow LNG Plant, Preparation of EIS, Brisbane/Gladstone (Arrow Energy)
- Pagham Harbour Coastal Defence Scheme, Preparation of EIS, Pagham UK (Environment Agency)
- QE2 Teesport Berth Development, Preparation of EIS, Teesport UK (PD Teesport)
- Round 3 Offshore Windfarms, Review of Ecological Constraints, Edinburgh UK (Airtricity)
- Onshore Windfarm bird survey methodology design, Edinburgh UK (Enertrag)
- Dover Harbour Terminal 2 Development, Preparation of EIS, Dover UK (Dover Harbour Board)
- Dudgeon Offshore Windfarm, Preparation of EIS, Edinburgh UK (Dudgeon Offshore Wind)
- Elgin Flood Alleviation Scheme, Ecological Surveys, Elgin UK (Moray Council)
- Seaham Harbour Redevelopment, Preparation of EIS, Seaham UK (Durham Council)
- Titchwell Managed Realignment, Preparation of EIS, Norfolk UK (Royal Society for the Protection of Birds)
- Forres (River Findhorn) Flood Alleviation Scheme, Ecological Surveys and Preparation of EIS, Elgin UK (Moray Council)
- Helix Project Phase II, Ecological Surveys, Grangemouth UK (British Waterways)
- Forres (River Findhorn) Flood Alleviation Scheme, Ecological Surveys, Elgin UK (Moray Council)
- Proposed Firth of Forth Windfarm, Review of Constraints, Edinburgh UK (Airtricity)
- Seahouses seawall upgrade, Ecological Surveys, Seahouses UK (Northumbria Council)
- Thames Estuary Maintenance Dredging, Review of Ecological Data, London UK (Port of London Authority)
- BERR Offshore Energy Strategic Assessment, Review of Survey Method, Edinburgh UK (BERR)
- Bo'ness Harbour Development, Wintering Bird Management Plan, Bo'ness UK (ING Estate)
- Brent Decommissioning, Sensitivity Assessment and Environmental Risk, Edinburgh UK (Shell)
- Canvey Biodiesel Plant, Preparation of EIS Addendum, Canvey UK (Sure Green Fuels)
- Barrow Waterfront Harbour Revision Order, Preparation of EIS, Barrow UK (West Lakes Renaissance)
- Trow Quarry Remediation Project, Ecological Surveys and Preparation of EIS, Trow UK (South Tyneside Council)
- Isle of Grain Windfarm, Review of Ecological Data, Isle of Grain UK (British Petroleum)
- Newhaven Desalination Plant, Preparation of EIS, Newhaven UK (Clarity Ltd)
- Strangford Lough Marine Current Turbine, Preparation of EIS, Strangford UK (SeaGen Ltd)
- Thanet Offshore Windfarm, Preparation of EIS Addendum, Thanet UK (Warwick Energy)
- River Carron Forth Gateway Project, Ecological Surveys, Grangemouth UK (British Waterways)

Sandra Walters

Associate Ecologist
EMM Consulting Pty Limited

Professional Overview

Sandra has 22 years' experience in terrestrial ecology, having worked for the past 10 years in environmental consultancy, following ecology roles in state government and private not-for-profit conservation. She has extensive experience in fauna and flora survey, natural resource management, fire management systems, pest animal management, and Indigenous cultural heritage management.

Sandra has applied her technical skills in Terrestrial Ecology, Environmental Impact Assessment, Fire Management, Mine Rehabilitation and Contaminated Land Assessment across a range of sectors including Defence, Mining and Gas, Energy, Rail, Construction, and State and Local Governments. Sandra has worked on projects in varied landscapes and legislative jurisdictions, including QLD, NSW, the ACT, Northern Territory and South Australia.

Qualifications and licences

Bachelor of Environmental Science, Charles Sturt University, 2010

Rainforest Plant Identification Certificate, JCU/ATH, 2013

QLD Department of Transport and Main Roads SOA E1 Technical Specialist, Ecology and Bushfire

'Suitably qualified person' QLD Protected Plants framework

Bushfire Attack Level Assessor, FPAA

Certified Environmental Practitioner (CEnVP), Environment Institute of Australia and New Zealand

Member, Environment Institute of Australia and New Zealand

Member Birdlife Australia, Australasian Bat Society, Queensland Wader Study Group, Native Plants Queensland

Baseline Security Clearance, Australian Government Security Vetting Agency

Certificate III Fire Communication Operations

Certificate II Public Safety (Firefighting Operations)

Specialisation

Terrestrial ecology

Environmental impact assessment

Fire management

Mine rehabilitation

Contaminated land assessment

Representative experience

Advisory Flora and Fauna Ecology

- Mackay Port access road, detailed environmental assessments, project manager / lead ecologist (Department of Transport and Main Roads)
- Mackay Kirkup Bridge Design, lead ecologist (Department of Transport and Main Roads)
- Port of Mackay and Port of Hay Point, environmental constraints analysis, project manager / lead ecologist (North Queensland Bulk Ports)
- Eton Range Realignment Denison and Stockyard Creek, fauna exclusion fence monitoring, lead ecologist (Department of Transport and Main Roads)
- Dalrymple Bay Coal Terminal 8X expansion EIS, lead ecologist (Dalrymple Bay Coal Terminal)
- Lake Lindsay Environmental Impact Assessment, senior ecologist (AngloAmerican)
- High Risk Species Management Plans for Port of Mackay, Port of Abbot Point, Port of Hay Point, and Port of Weipa, project manager / lead ecologist (North Queensland Bulk Ports)
- Kennedy Highway environmental assessment, lead ecologist (Department of Transport and Main Roads)
- Peak Downs Highway Hazard Reduction, lead ecologist (Department of Transport and Main Roads)
- Mackay Ring Road Fursden Creek, Platypus survey management plan, lead ecologist (Department of Transport and Main Roads)
- West Funnel Creek Bridge Replacement survey management plans, lead ecologist (Mackay Regional Council)
- Bee Creek Bridge Replacement, lead ecologist (Mackay Regional Council)
- Sandy Gully Bridge Replacement, lead ecologist (Department of Transport and Main Roads)
- Wide Centreline environmental scoping report, Innisfail to Ingham, QLD, lead ecologist (Department of Transport and Main Roads)
- Cape Gloucester Subdivision, senior ecologist (Aldabra Pty Ltd)
- Warnervale Link Road Review of Environmental Factors, lead ecologist (Central Coast Council)
- Wiggins Island Coal Export Terminal ecological assessments, senior ecologist (Wiggins Island Coal Export Terminal)
- Dysart Road Realignment, Peak Downs Coal Mine, senior ecologist (BHP Billiton Mitsubishi Alliance)
- Goyder River Crossing and Road Realignment, senior ecologist (Department of Construction and Infrastructure)
- Roma and Fairview Gas Fields, senior ecologist (Santos)

Spotter catcher services

- Roma and Fairview Gas Fields: Spotter catcher services for 14 separate construction projects (new roads and well lease constructions) (Santos)
- Hutton and Christmas Creek, Fairview Gas Fields: Platypus surveys and preparation of Platypus SMP for the pipeline transmission project. Preparation of SMP for Roma and Fairview Gas Fields (Santos)
- Bedford Rd, Mackay: Spotter catcher services for vegetation clearing for new housing development (Shadforth Civil Construction)

- Hay Point Coal Export Terminal: Spotter catcher services for linear vegetation clearing for new high voltage powerline for HPX3 expansion at Hay Point Coal Export Terminal (Thiess)
- Hay Point Coal Export Terminal: Spotter catcher services for vegetation clearing and land reclamation operations – tidal and marine environments (BMD Constructions)
- Sheep station Creek Rail Level Crossing: Spotter catcher services during vegetation clearing to improve the line of sight (Coal Stream Alliance)
- Blackmans Gap Rd cutting upgrade: Spotter catcher services for widening and upgrade of steep cutting (Gladstone City Council)
- Yakapari-Habana Rd: Spotter catcher services for vegetation clearing associated with the installation of new power transmission line and pole (Ergon Energy)

Weed and pest animal management

- Central Queensland Region Pest and Weed Survey: Part of a team that surveyed over 30,000 km of DTMR road network for declared weeds and pest animals over four weeks (Department of Transport and Main Roads)
- Ecological Field Assessments, QLD: Pre-clearance and Baseline Weed Surveys - Newlands system at Havilah and Jilalan Rail Yards (Aurizon)
- Prepared Pest Animal Management Plan for Gas Transmission Pipeline from Roma and Fairview Gas Fields to Gladstone (Santos)

Biodiversity offsets

- Preparation of Biodiversity Offset Plan for Heathcote Railway Station upgrade (Novorail)
- Offline storage area Biodiversity Offsets Assessment. Field surveys to verify mapped areas of suitable offset vegetation using Ecological Equivalence Methodology (Gladstone Area Water Board)

Land contamination

- Glenpark St Overpass Duplication, Mackay, QLD: Contaminated Site Investigation within rail corridor involving intrusive sampling, laboratory results analysis and site characterisation under NEPM guidelines. Preparation of Acid Sulphate Soil Management Plan for the project (Mackay Regional Council)
- Preliminary Site Investigation Reports to facilitate the upgrade of infrastructure at Granville, Gordon, Strathfield, Hornsby and Undercliffe Railway Stations (Novorail)
- Preliminary Site Investigation Reports to facilitate the upgrade of infrastructure at Mulgrave, Meeks and Canterbury Railway Stations (Transport for NSW)

Mine rehabilitation

- Meandu Mine environmental approval amendment, senior environmental scientist (Stanwell Corporation)

Department of Defence Projects

Ecology

- Tully Training Area ecological assessment, lead ecologist
- Bradshaw Bush Blitz, expert mammal and bird ecologist
- Biodiversity monitoring strategy, NT, project leader / lead ecologist
- Cultana Training Area Expansion environmental report, lead ecologist / report author /reviewer
- Woomera Test Range ecological assessment, lead fauna ecologist / report author
- RAAF Tindal Mahogany Replacement Program, senior ecologist
- PDS Northern Australia Regional Environmental Lead, lead environmental advisor to Defence PDS Projects

Bushfire Management

- Bushfire Management Plans, Expert Technical Panel Member
- Review and Reissue of Existing Bushfire Management Plans, Project Design Manager / author
- Revision of Bushfire Management Plans with integration into GEMS, design manager / expert technical review panel member

Land Contamination

- Kangaroo Flats Training Area, Mount Bundey Training Area, Robertson Barracks, Mount Stuart Training Area, and Townsville Field Training Area, National Lead Contamination Audit / field sampling and report author
- RAAF Base Darwin, asbestos stockpile sampling, field sampling and report author
- Halifax Bay Training Area, marine water and benthic environment surveys, field ecologist and reporting support

Publications and conference presentations

- Walters, S & Goedegebuure, M, 2021 Effectiveness of fauna-sensitive infrastructure in reducing roadkill of koala in Central Queensland (in prep)
- Farrell, C & Walters, S, 2016 Combining multiple bushfire behaviour models for improved hazard assessment. Presentation at Fire Australia 2015 Conference, Fire Protection Association of Australia.

Dr Elliot Leach

Ecologist

EMM Consulting Pty Limited

Professional Overview

Elliot is an Ecologist who completed a PhD on Australian rainforest birds in 2017. He has extensive field experience in eastern Australia. Elliot has worked on a wide range of biodiversity surveys and threatened species surveys.

Since joining EMM in 2018, Elliot has carried out threatened species surveys in New South Wales, the Australian Capital Territory and Queensland. He has also assisted with desktop biodiversity assessment, reporting and fieldwork for projects in Queensland.

Qualifications and licences

Doctor of Philosophy "Monitoring the effects of climate change on the rainforest birds of eastern Australia" Griffith University, 2018

Bachelor of Science (Hons I) Ecology and Conservation Biology, Griffith University, 2013

Specialisation

Threatened species surveys

Desktop biodiversity assessments

Representative experience

Infrastructure

- Inland Rail, desktop biodiversity assessment, planning of ecological surveys, ecological fieldwork, reporting, QLD (ARTC)
- Snowy 2.0; threatened species surveys, Kosciuszko National Park, NSW (Snowy Hydro Limited)
- Mona Vale Road upgrade, threatened species surveys, Ku-ring-gai Chase National Park, NSW (NSW Roads & Maritime Services)
- Moreton Bay Rail Link project, design, construction and installation of wildlife telemetry equipment to monitor movement and behaviour of koalas, QLD (QLD Transport & Main Roads)
- SEQ Koala retrofit works, koala surveys and monitoring, south east QLD (QLD Transport & Main Roads)

Resource industries

- Karreman Quarries Offset Project, vegetation surveys and pre-clearance ecology surveys, south east QLD (Karreman Quarries)
- Hall Quarry overburden, threatened species surveys, NSW (Boral)
- Blackwater Mine, desktop biodiversity assessment and planning of baseline ecological surveys for proposed future expansion, central QLD (BMA)

Renewable energy

- Epuron Specimen Hill Windfarm, bird utilisation surveys, threatened fauna and flora surveys, reporting, central QLD (Epuron)
- Epuron Boulder Creek windfarm, bird utilisation surveys, reporting, central QLD (Epuron)
- Ti-tree Bioenergy, bird of prey surveys and mitigation strategy, south east QLD (Veolia)

Research

- Mt Tamborine BioBlitz, multidisciplinary biodiversity surveys (Griffith University, Queensland Museum and Scenic Rim Council)
- Border Ranges National Park, community level avifauna surveys, north eastern NSW (Griffith University)
- Eungella National Park, multidisciplinary biodiversity surveys, central QLD (Griffith University)
- Mt Lewis National Park, multidisciplinary biodiversity surveys, far north QLD (Griffith University)

Appendix C

MNES Likelihood of Occurrence

QUEENSLAND PACIFIC METALS

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C.1 Criteria

A refined likelihood of occurrence has been prepared for the potential MNES and MSES associated with the Project based on EMM's desktop assessment and findings. This assessment was informed by the results of the background research, database searches and field assessments completed.

Definitions used for the refined likelihood of occurrence are described below:

1. **Known** – records of the species exist in the Project area.

2. **Likely** – species records exist within the study area and suitable habitat is mapped within 2 km of the Project area.

3. **Potential** – species records exist within the study area, suitable habitat for the species exists within study area, but there is insufficient information to categorise the species as likely, or unlikely to occur, in the Project area.

4. **Unlikely** – a low to very low probability that a species will occur in the Project area due to the lack of suitable habitat or is outside the species known geographical range.

The refined likelihood of occurrence assessments are provided below and those ecological communities and species identified as 'known', 'likely' or have 'potential' to occur in the Project area are summarised in following sections.

C.2 TEC

Table C.1 Threatened ecological communities

TECs	EPBC Act status	Associated ground-truthed regional ecosystems	Refined likelihood of occurrence	Rationale
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	11.4.8, 11.4.9	Known	The Brigalow TEC associated HVR RE 11.4.9 was present in a small area on Lot 23 within the Project area, and in a number of patches on Lot 411. Areas on Lot 411 are now excluded from the Project and will not be impacted. Remaining areas of RE 11.4.8 and 11.4.9 on Lot 411 failed to meet TEC conditional thresholds, primarily due to weed cover and other aspects of disturbance.
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	-	Unlikely	Regional ecosystems associated with this TEC were ground-truthed during field surveys on Lot 23 and 411, however were severely degraded and did not meet patch size for this TEC. All grassland habitats within the Project area consisted primarily of exotic pasture grass species and exist on atypical soil types for the TEC.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	-	Unlikely	No regional ecosystems associated with this TEC were identified during field surveys.
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	-	Unlikely	No regional ecosystems associated with this TEC were identified during field surveys.

C.3 Fauna species

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Calidris ferruginea	Curlew Sandpiper	✓	×	CE, Mi	E	This migratory shorebird species spends its non-breeding season in coastal parts of Australia. The species has been recorded in various inland regions as it migrates to southern parts of the Australian coastline (Pizzey et al. 2012). Near the coast, it typically inhabits intertidal mudflats in sheltered areas. When inland, they utilise ephemeral and permanent lakes, lagoons, ponds or dams with bare edges of mud. The species does not breed in Australia (DAWE 2022j).	Unlikely	Preferred habitats of coastal mudflats and shallow wetlands are not known to occur within the study area. The desktop reviews confirmed no records of this species within the Project area and optimal habitats do not occur.
Dasyurus hallucatus	Northern Quoll	✓	×	E	-	This species utilises a wide range of habitats, showing preference for eucalypt woodlands, riparian vegetation, and vine thickets. They are recorded in higher densities where these areas remain in proximity to suitable denning habitat of steep rocky terrain with crevices and other sheltering microhabitats (TSSC 2005).	Unlikely	No suitable habitat exists within the study area for this species. No rocky habitat is present within the Project area, and riparian habitat is extensively modified and degraded. This species has suffered significant decline in recent decades, with the nearest known population within the Clark-Connors Range, west of Mackay. As such, Northern Quoll is considered unlikely to occur within the Project area.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Denisonia maculata	Ornamental Snake	✓	✓ (2015)	V	V	The Ornamental Snake is a nocturnal species known only from the Brigalow Belt North and the Brigalow Belt South biogeographical regions. Its preferred habitat includes woodlands (Acacia and Eucalypt) and open forests associated with moist areas and cracking clays. It has been recorded from multiple regional ecosystems including RE11.4.3, 11.4.6, 11.4.8, 11.4.9, 11.3.3, 11.5.16, most regularly from those associated with clay soils (Land zone 4). It shelters within deep soil cracks, under coarse woody debris and amongst deep leaf litter. It feeds almost exclusively on frog species and therefore is most active during wet conditions (DAWE 2022a).	Known	Suitable habitat occurs throughout the Project area and multiple desktop records exist (66 records in the study area). This species was recorded by EMM during March 2022 survey.
Egernia rugosa	Yakka Skink	✓	×	V	V	The Yakka Skink occurs in a variety of habitats including eucalypt and acacia woodland, as well as *Callitris* and *Casuarina* dominated communities. Within these communities it requires specific refuge microhabitats including partially buried timber and large rocks, disused animal burrows, and hollow logs (DAWE 2022k).	Unlikely	No records of this species exist within the region. This large skink utilises Brigalow habitats and in particular, hollow ground logs for denning. Ground timber throughout the Project area is predominantly recently felled trees with a paucity of hollows. The presence of this species is often detected via its conspicuous latrine sites. None were observed within the Project area, and this species is considered unlikely to occur.
Elysea albagula	White-throated Snapping Turtle	✓	×	CE	CE	The White-throated Snapping Turtle is the largest short-necked freshwater turtle in Australia. The species is only found in Queensland in the Fitzroy, Mary and Burnett Rivers and associated drainages. It is typically found in clear, flowing, well-oxygenated waters (DES 2022a). Most records of the species are from larger river systems.	Unlikely	This species utilises riverine habitats within the Fitzroy, Mary and Burnett River catchment. This habitat is not present within the Project area.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Erythrotriorchis radiatus	Red Goshawk	✓	×	V	E	The Red Goshawk is a large bird of prey that primarily feeds on other bird species. Its preferred habitat consists of a mosaic of vegetation types including forest and woodland communities with ample prey populations and permanent water. Regular prey species include Corvids, Kingfishers and Parrots. Nesting locations are highly specific and usually restricted to trees taller than 20 m and within 1 km of a permanent watercourse or wetland (DAWE 2022l).	Unlikely	This species has undergone a well-documented and severe northerly range retraction in recent decades. Currently, its breeding population is restricted to Cape York peninsula and parts of the Northern Territory (DAWE 2022l). The species utilises coastal and sub-coastal tall open forests and woodlands, tropical savannas traversed by wooded or forested rivers, and the edges of rainforest. This habitat is not present within the Project area.
Falco hypoleucos	Grey Falcon	✓	×	V	V	The Grey Falcon inhabits woodland, shrubland and grasslands in the arid and semi-arid zones (Menkhorst et al. 2017).	Unlikely	There are no regional records of Grey Falcon and it is mostly restricted to arid habitats. Therefore, the species is considered unlikely to occur.
Furina dunmalli	Dunmall's Snake	✓	×	V	V	Dunmall's Snake is a small elapid that primarily occurs in the Brigalow Belt region and is considered very rare with limited records. It has been recorded in forests and woodland dominated by Brigalow and other Acacia, native Cypress or Bull-oak. It shelters under woody debris and leaf litter and may use cracks in alluvial clay soils. Suitable soils occur on LZ 4 and 10 (DAWE 2022m).	Unlikely	Suitable habitat occurring within the Project area is severely limited and no confirmed records are available. Therefore, the species is considered unlikely to occur.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Geophaps scripta scripta	Squatter Pigeon (southern)	✓	✓ (1990)	V	V	The Squatter Pigeon is a medium-sized, terrestrial pigeon that occurs from Cape York to southern Queensland (formerly to northern New South Wales). Habitat for the species is generally open-forests to sparse open-woodlands and scrub, dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species, within 3 km of surface water. Squatter Pigeons prefer areas in these habitats with low ground cover, typically below 33%. Soils in these areas consist of sandy substrates dissected with low gravely ridges (DAWE 2022b).	Known	Multiple records of this species exist within the study area (12 records). Field surveys identified this species as being present in the Project area and as such the species is considered known to occur.
Grantiella picta	Painted Honeyeater	✓	×	V	V	The Painted Honeyeater is a nomadic species that occurs in inland areas spanning from central Victoria, through NSW into central QLD and eastern NT. It occupies dry, open forests and woodlands including box, ironbark, yellow gum, *Melaleuca, Casuarina, Callitris,* and *Acacia* communities. It feeds primarily on Mistletoe (Loranthaceae) fruits and its movements are highly dependent on fruit availability (DAWE 2022n).	Unlikely	Areas of potential habitat (which consist of remnant Acacia woodlands and riparian eucalypt vegetation with mistletoe species such as *Amyema quandang*) do not occur.
Hirundapus caudacutus	White-throated Needletail	✓	×	V	V	A regular summer non-breeding migrant to eastern Australia, the White-throated Needletail is a highly aerial species that forages in the airspace over most habitats. However, the shows some preference for forested hilly areas and coastal ranges. Its roosting habits are poorly known but it has been recorded roosting in woodlands, high amongst the foliage of large Eucalypt species (Pizzey et al. 2012).	Likely	Recorded by EMM in December 2021 along the old alignment, and adjacent to the Project area in March 2022. The species habitat preferences indicate that it could occur in any airspace over the entire Project area.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Lerista allanae	Retro Slider	✓	×	E	E	This species occurs in a small distribution near Clermont, on black soil. Recent records of the skink were from leaf litter and friable soils beneath trees and shrubs (Borsboom et al. in prep.).	Unlikely	The Project area is outside the known distribution of the species and habitat is unsuitable. Known only from a small area near Clermont/Capella, south of the Project area, in open grasslands and grassy woodland, on black and red soil.
Macroderma gigas	Ghost Bat	✓	×	V	E	This species requires specific breeding habitat throughout its range. Breeding sites are typically large, deep natural caves or abandoned mineshafts, which provide stable environmental conditions. During the non-breeding season, roosting habits are more variable, and the species will utilise rock crevices and overhangs. The species forages in close proximity to roosting sites, in woodland, monsoonal rainforest, and dry vine thickets (Hourigan 2011).	Unlikely	Roosts in large sandstone and limestone caves. This habitat is not present in the Project area, and the nearest known population is at Cape Hillsborough, north of Mackay
Neochmia ruficauda ruficauda	Star Finch (Eastern)	✓	×	E	E	This species prefers natural grasslands and grassy woodlands and is often associated with permanent or ephemeral wetlands. Preferred woodlands consist primarily of eucalypts, as well as *Melaleuca* and *Casuarina* species (DAWE 2022o). In recent decades, the distribution of the species has largely contracted to eastern Cape York and the Gulf of Carpentaria (Pizzey et al. 2012).	Unlikely	No records of this species exist within the study area. This species has recently undergone an extreme range reduction and as such these records are likely to be historical. Therefore, the species is considered unlikely to occur.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Nyctophilus corbeni	Corben's Long-eared Bat	✓	×	V	V	Corben's Long-eared Bat is a dark grey-brown bat with long ears and a shallow muzzle ridge groove. Its preferred habitat is eucalypt woodland including box/ironbark/cypress pine woodlands, Bull-oak woodlands, Brigalow woodlands, and Belah woodland. It roosts under loose bark or in the crevices and hollows of trees. Overall it is considered a relatively rare species (TSSC 2015b).	Unlikely	The desktop review did not identify any record of the species within the study area. The Project area appears to be beyond the known northern limit of the species distribution and the closest record is to the south in Expedition National Park.
Petauroides volans volans	Greater Glider	✓	✓ (2014)	E	E	This folivore prefers eucalypt woodlands with a high diversity of mature myrtaceous tree species and abundant hollows. Populations of this species are sensitive to habitat disturbance and particularly the removal of large mature trees (van der Ree et al. 2004).	Unlikely	Records of Greater Glider exist within the study area (seven records) associated with riparian vegetation to the east. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The Greater Glider was not identified when undertaking nocturnal spotlighting surveys or through scat observations. It is unlikely the species is present due to the lack of large mature hollow bearing trees and scarcity of large hollows. The Project area is largely fragmented and has been previously cleared with non-remnant and regrowth vegetation being the dominant vegetation features. This limits large, mature hollow bearing trees for the Greater Glider to feed on or dwell in. Due to unsuitable habitat within the majority Project area, absence of records within the study area, lack of mature trees and a scarcity of large hollows it is unlikely this species is present.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
								There is a small section of the alignment on Lot 11 that contains RE 11.5.3 – *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces. This woodland is mapped correctly and contains *E. crebra* and *C. clarksoniana* trees around 14 m high. Some hollows are present, but they are relatively scarce (approximately five per hectare) and small in size, as the woodland appears to have been subject to selective clearing in the past. Due to the open nature of the canopy, small numbers of hollows and lack of connectivity to more optimal Greater Glider habitat, this area is considered unlikely habitat for Greater Glider, and this was confirmed through a lack of records in intensive spotlighting in November 2022. Areas of RE 11.5.3 on Lot 2 are unsuitable for Greater Glider, as they have been cleared in the past and have now regrown to achieve remnant status. However, hollows have not yet developed in the canopy trees, so no denning habitat for the glider is present.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Phascolarctos cinereus	Koala	✓	×	E	E	The Koala is an iconic arboreal mammal that inhabits a range of temperate, sub-tropical and tropical and semi-arid habitats throughout eastern Australia. It forages almost exclusively on myrtaceous tree species within the genera of *Eucalyptus, Corymbia, Angophora, Lophostemon* and *Melaleuca*. Preferred species within these genera vary according to range but are predominated by *Eucalyptus* species (DAWE 2022f).	Potential (low)	No records of Koala exist within the study area. The species is not considered likely to occur in the Project area, and is scarce in the Moranbah region and has not been recorded to date. No individuals were recorded and no scratches or scats associated with the species were recorded. If present in the region, the species is likely to be restricted to riparian areas of major watercourses. The Project area is largely cleared and dominated by dense weedy ground-cover. Koala is considered to have a low potential to occur in the Project area.
Poephila cincta cincta	Southern Black-throated Finch	✓	×	E	E	The Southern Black-throated Finch has undergone an extensive northerly range retraction. Its preferred habitats consist of grassy woodland dominated by eucalypts (savannah communities), but it will also use *Melaleuca* or *Acacia* dominated communities with a diversity of grass species. Riparian habitats can also be utilised within highly fragmented and modified environments (DAWE 2022p).	Unlikely	Utilises savannah grasslands and riverine wetlands dominated by eucalypts, paperbarks or acacias and is known from localities close to Townsville. This habitat is not present in the Project area, and it is outside the species' range.
Rheodytes leukops	Fitzroy River Turtle	✓	×	V	V	The Fitzroy River turtle inhabits permanent freshwater riverine reaches and large, isolated permanent waterholes. It is only found in the Fitzroy River and its tributaries (DAWE 2022q).	Unlikely	The desktop review did not identify any records of this species within the study area. Only found in the Fitzroy River and its tributaries, in flowing rivers with deep pools. This habitat is not present in the Project area.

Table C.2 Fauna species

Scientific name	Common name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Rostratula australis	Australian Painted Snipe	✓	×	E	E	The Australian Painted Snipe is a predominately crepuscular and nocturnal shorebird species. Its preferred habitats include shallow ephemeral freshwater wetlands such as swamps, gilgai and streams with ample vegetative cover. It is most common in south-eastern Australia but can exhibit dispersive characteristics and has been known to occur far from its usual range when conditions are suitable, usually following rain events (DAWE 2022c).	Potential	No records of this species exist within the study area although areas of potentially suitable habitat in the form gilgai occur within the Project area. Such habitats may be utilised on a sporadic basis if the species is present in the region. The Australian Painted Snipe is a predominately crepuscular and nocturnal shorebird species. It is most common in south eastern Australia but can exhibit dispersive characteristics and has been known to turn up far from its usual range when conditions are suitable post rain events. The species was not recorded during field surveys. However due to its nomadic nature this species is considered to have the low potential to occur during suitably wet conditions, although any occurrence is likely to be sporadic.
Tyto novaehollandiae kimberli	Masked Owl (northern)	✓	×	E	V	Roosting in tree hollows, dense foliage or caves, the northern Masked Owl occupies a wide variety of woodland and forest ecosystems (Menkhorst et al 2017), with some preference for tall open Eucalypt forests with suitable hollows for nesting (DAWE 2022r).	Unlikely	Utilises woodland habitats with well-developed tree hollows for roosting and hunting, as well as open grasslands and grassy woodlands. The southern limit of the species is not precisely known, but likely to be further north than the Project area. Suitable habitat is not present.

1. EPBC Act status: CE- critically endangered, E – endangered, V – vulnerable, M – migratory, Ma – marine
2. NC Act status: CE – critically endangered, E – endangered, V – vulnerable, NT – near threatened, SLC – special least concern

C.4 Flora species

Table C.3 Flora species

Scientific name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Bertya opponens	✓	✓ (2013)	V	LC	The species occurs in the region primarily on lateritic 'jump-ups' (Land zone 7) in association with Lancewood (*Acacia shirleyi*) communities (DAWE 2022s).	Unlikely	No records exist in the study area, and the habitat types are not present in the Project area. This species is unlikely to occur.
Denhamia megacarpa	✓	×	E	E	The species is similar in appearance to *Denhamia oleaster* which is widespread in eastern central Queensland, however *Denhamia megacarpa* is restricted to a few sites around Junee and Mackenzie, although there is a record near Glenden. It occurs on sandy or gravelly soils in open eucalypt woodland (e.g. RE 11.5.9 or 11.7.2), whereas *Denhamia oleaster* occurs on soils with a higher clay content (DCCEEW 2023). The two species have not been observed growing in association with one another.	Unlikely	No records exist in the study area, and the associated REs are not present in the Project area (although some areas of sandier soil occur within the alignment). This species is unlikely to occur.
Dichanthium queenslandicum	✓	✓ (2018)	E	V	This grasses occurrence is confined to heavy black clay soils on undulating plain where it is typically found in natural grassland communities. It can however also occur in other communities on this soil type such as eucalypt and acacia woodlands (DES 2022b).	Unlikely	Due to a lack of suitable native grasslands and extensive areas of Buffel Grass along with cattle grazing, the species is considered unlikely to occur in much of the alignment. There are 26 records within the study area. Extensive field surveys failed to detect the species.

Table C.3 Flora species

Scientific name	PMST search	Wildlife online (most recent record)	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Dichanthium setosum	✓	×	V	LC	The species occurs in heavy soils (cracking clays and alluvium) in woodland or open woodland from Toowoomba to the Lynd Junction, west-north-west of Townsville (DAWE 2022t).	Unlikely	Due to a lack of suitable native grasslands and extensive areas of Buffel Grass along with cattle grazing, the species is considered unlikely to occur in much of the alignment. No records exist within the study area. The nearest record is 40 km to the east from Hail Creek. Extensive field surveys failed to detect the species.
Eucalyptus raveretiana	✓	×	V	LC	The species is found along watercourses, and occasionally on river flats, in scattered populations from Ayr south to Rockhampton (DAWE 2022u).	Unlikely	No records of this species exist within the study area with the closest record being approximately 40 km east of the Project area. This species occurs in riparian (river) habitats, which are not present in the Project area, and this species was confirmed to be absent. As such the species is considered unlikely to occur.
Samadera bidwillii	✓	×	V	V	This species predominately grows in or adjacent to lowland rainforest but can also occur in other community types such as open eucalypt forests and woodlands. In these areas it is commonly found in association with ephemeral and permanent streams. The species also has broad soil preferences with individuals recorded loams, silts, sands, and clays (DES 2022c).	Unlikely	No records exist in the study area, and the habitat types are not present in the Project area. This species is unlikely to occur.
Solanum graniticum	✓	×	E	LC	Found on Gloucester Island near Bowen, and the adjacent mainland. It occurs in open eucalypt woodland slopes, on soils derived from granite (DAWE 2022v).	Unlikely	The Project area is well outside the known geographical range of the species and suitable habitats do not exist. Therefore, the species is considered unlikely to occur.

3. EPBC Act status: CE- critically endangered, E – endangered, V – vulnerable, M – migratory, Ma – marine
4. NC Act status: CE – critically endangered, E – endangered, V – vulnerable, NT – near threatened, SLC – special least concern

C.5 Migratory species

Table C.4 Migratory species

Scientific name	Common Name	PMST search	Wildlife online	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Migratory terrestrial birds								
Cuculus optatus	Oriental Cuckoo	✓	×	Mi	SL (Mi)	This species is a summer visitor to Australia. It inhabits a wide range of habitats, including dense to open woodlands and forests, vine thickets monsoonal rainforest and wet sclerophyll forest. It particularly prefers the edges of riparian forests (Menkhorst et al. 2017).	Unlikely	No records of this species exist within the study area and no suitable habitat occurs within the Project area.
Hirundapus caudacutus	White-throated Needletail	✓	×	V, Mi	V	This species is almost exclusively aerial in Australia. The species is usually seen in foraging flocks over many habitat types including open forest and rainforest, cleared areas and heathland. They also prefer areas with updrafts (e.g. hills and coastal cliffs) (Pizzey et al. 2012).	Known	This species was recorded during December 2021 surveys and adjacent to the Project area in March 2022 surveys.
Monarcha melanopsis	Black-faced Monarch	×	✓ (1984)	Mi	SL (Mi)	This species is widespread in eastern Australia. It mainly inhabits rainforest systems, including vine thickets, warm temperate rainforests and dry rainforests. The species can also be found in gullies in open eucalypt forests and coastal foothills.	Unlikely	Although records occur in the study area, there is no suitable habitat in the Project area and the species is unlikely to occur.
Motacilla flava	Yellow Wagtail	✓	×	Mi	SL (Mi)	This species is an annual migrant to northern Australia and is primarily associated with wetlands, marshlands, exposed mud, and moist grasslands (Menkhorst et al. 2017).	Unlikely	This species has not been recorded within the region; however, it is considered an uncommon visitor to northern Australia and only marginal likely occurs within the Project area. As such, the species is considered unlikely to occur.
Migratory wetland birds								
Actitis hypoleucos	Common Sandpiper	✓	×	Mi	SL (Mi)	This species prefers coastal wetlands and are found around muddy margins or rocky shores. It occurs in some inland wetlands (Menkhorst et al. 2017).	Unlikely	No records or preferred habitats occur within the Project area. As such it is considered unlikely to occur.

Table C.4 Migratory species

Scientific name	Common Name	PMST search	Wildlife online	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Calidris acuminata	Sharp-tailed Sandpiper	✓	×	Mi	SL (Mi)	This species spends its non-breeding season in Australia along muddy edges of shallow fresh or brackish wetlands. Wetlands they occupy include lagoons, swamps, lakes and dams (Menkhorst et al. 2017).	Unlikely	No records or preferred habitats occur within the Project area. As such it is considered unlikely to occur.
Calidris ferruginea	Curlew Sandpiper	✓	×	CE, Mi	E	This migratory shorebird species spends its' non-breeding season in coastal parts of Australia. The species has been recorded in various inland regions as it migrates to southern parts of the Australian coastline (Pizzey et al. 2012). Near the coast, it typically inhabits intertidal mudflats in sheltered areas. When inland, they utilise ephemeral and permanent lakes, lagoons, ponds or dams with bare edges of mud. The species does not breed in Australia (Menkhorst et al. 2017).	Unlikely	No records or preferred habitats occur within the Project area. As such it is considered unlikely to occur.
Calidris melanotos	Pectoral Sandpiper	✓	×	Mi	SL (Mi)	This species mainly occurs in coastal habitats at lagoons, estuaries, swamps and lakes. It can occasionally be found inland. It prefers open fringing mudflats on wetlands (DAWE 2022w).	Unlikely	No records or preferred habitats occur within the Project area. As such it is considered unlikely to occur.
Gallinago hardwickii	Latham's Snipe	✓	×	Mi	SL (Mi)	This species is a non-breeding visitor to south-eastern Australia. It mainly occurs in permanent and ephemeral freshwater wetlands with low, dense vegetation but can also occur in saline or brackish wetlands that are artificial or modified (Menkhorst et al. 2017).	Likely	Latham's Snipe has been recorded within the study area and potential habitat occurs within the Project area, particularly during the wet season when gilgai habitat may hold water. Therefore, the species is considered likely to occur.
Pandion cristatus	Eastern Osprey	✓	×	Mi	SL (Mi)	This species mainly occurs in coastal areas but occasionally occur inland along major river systems. They inhabit wetland habitats such as bays, beaches, mangrove swamps and large lakes. They require brackish or saline water for foraging (Menkhorst et al. 2017).	Unlikely	No records or preferred habitats occur within the Project area. As such it is considered unlikely to occur.

Table C.4 Migratory species

Scientific name	Common Name	PMST search	Wildlife online	EPBC Act status[1]	NC Act status[2]	Habitat and ecology	Likelihood of occurrence	Rationale
Migratory marine birds								
Apus pacificus	Fork-tailed Swift	✓	×	Mi	SL (Mi)	This species is almost exclusively aerial and occurs mainly over inland plains. Habitats include riparian woodland, heathland and low scrub areas. They also occur in coastal areas over cliffs and beaches (Menkhorst et al. 2017).	Likely	During surveys this species was identified adjacent to the Project area; therefore, it is considered as likely to occur.

1. Act status: CE- critically endangered, E – endangered, V – vulnerable, M – migratory, Ma – marine
2. NC Act status: CE – critically endangered, E – endangered, V – vulnerable, NT – near threatened, SLC – special least concern

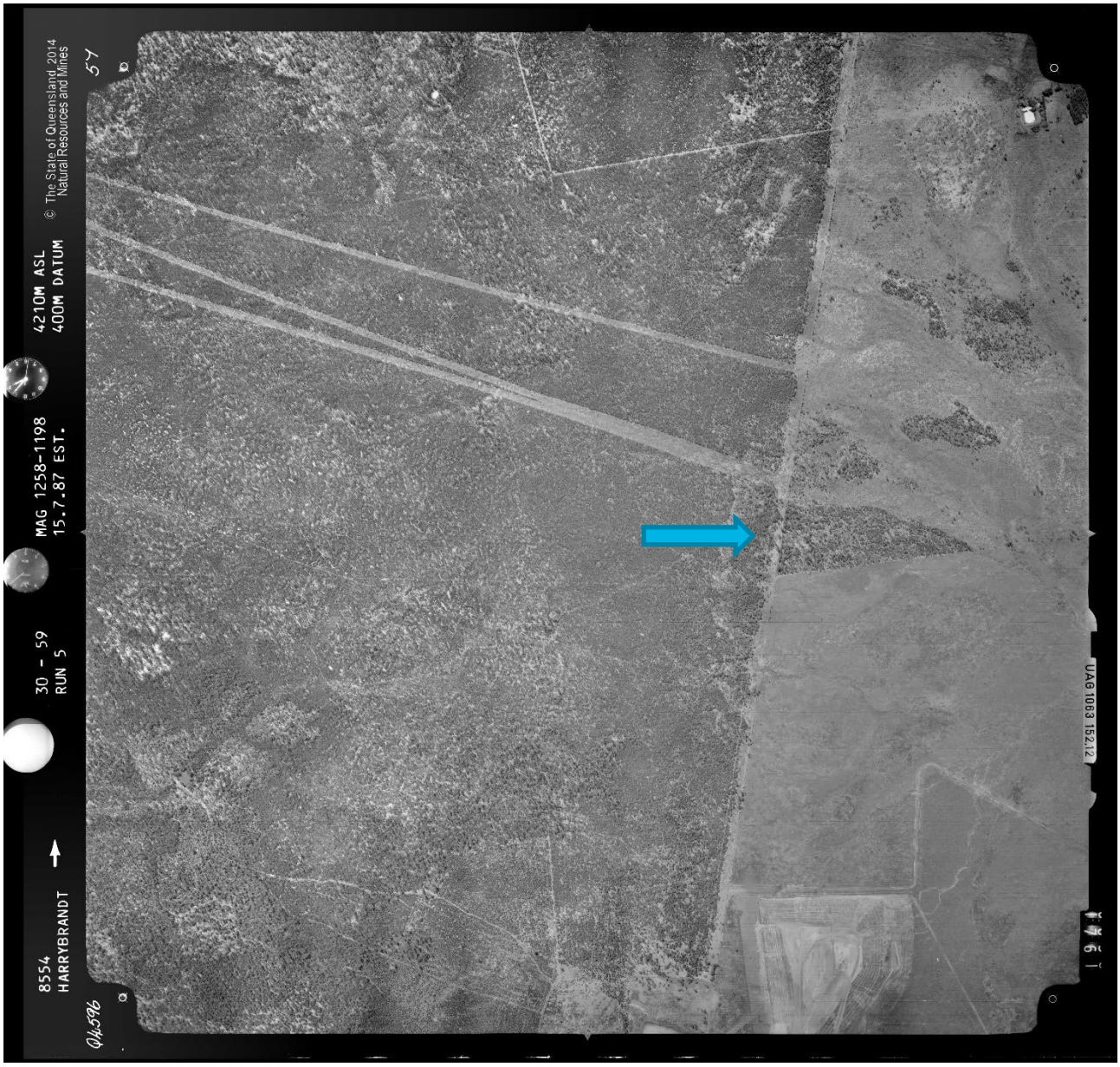
Appendix D

Historical Aerial Imagery

QUEENSLAND PACIFIC METALS

EMM
creating opportunities

D.1 1987



Source: Q Imagery https://qimagery.information.qld.gov.au/

Figure D.1 1987 image, vegetation to north of Goonyella Rd intact, cleared to south

D.2 2000

Source: Q Imagery https://qimagery.information.qld.gov.au/

Figure D.2 2000 image, polygon 1 (arrow 1), polygon 2 (arrow 2) & polygon 6 (arrow 3) vegetation intact

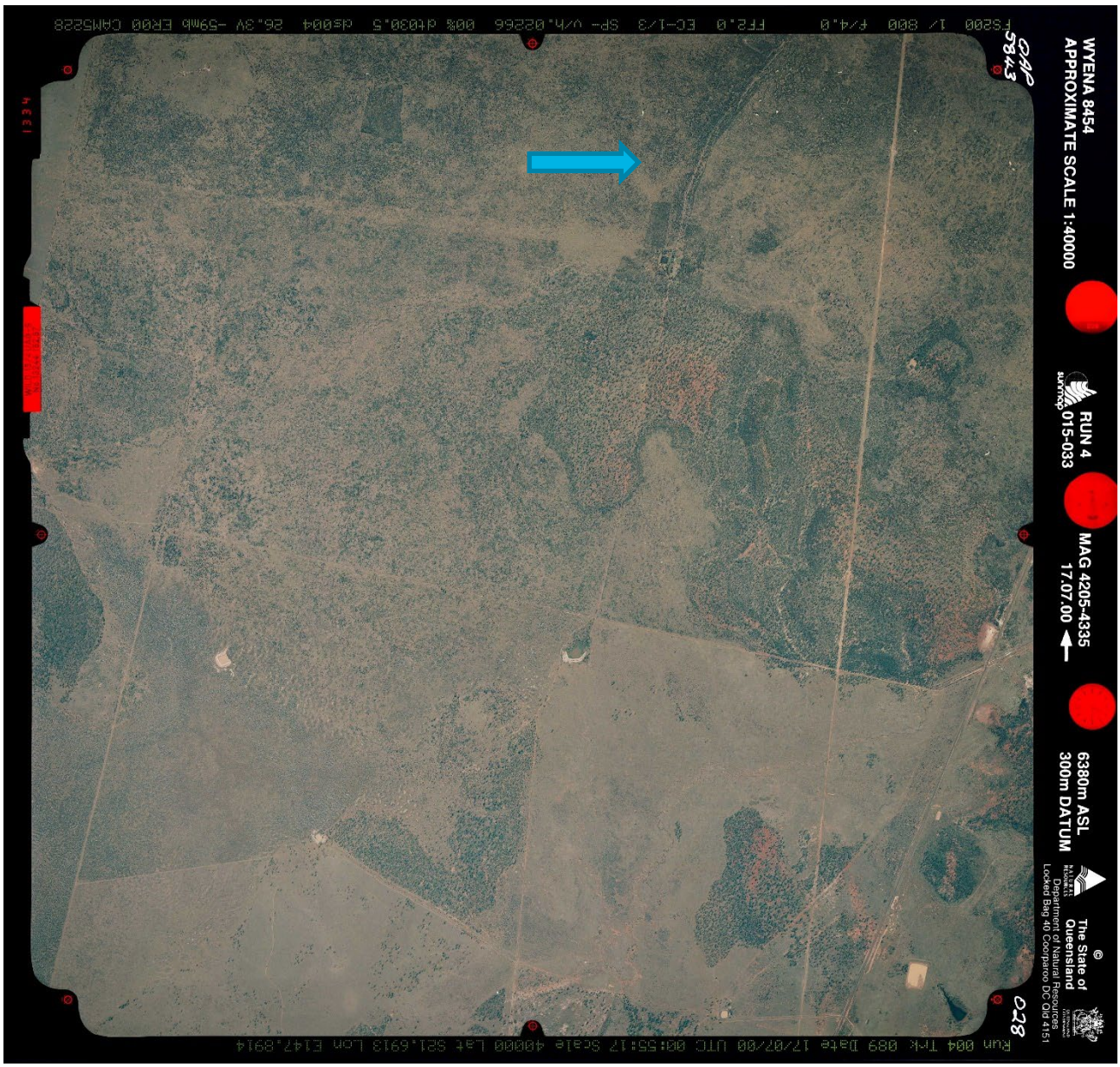
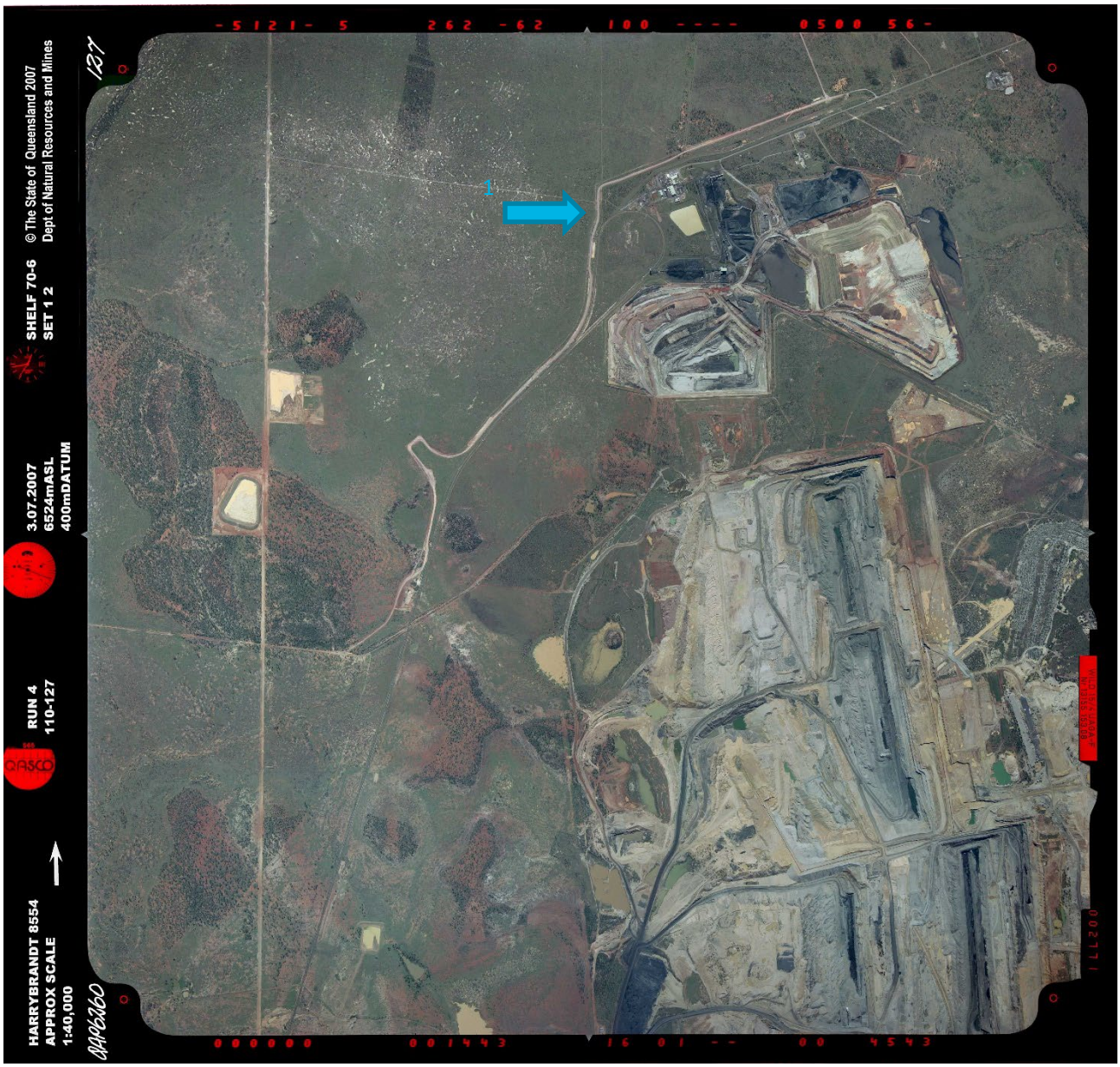


Figure D.3 2000 image, western alignment on Lot 23 (approximate location marked with arrow)

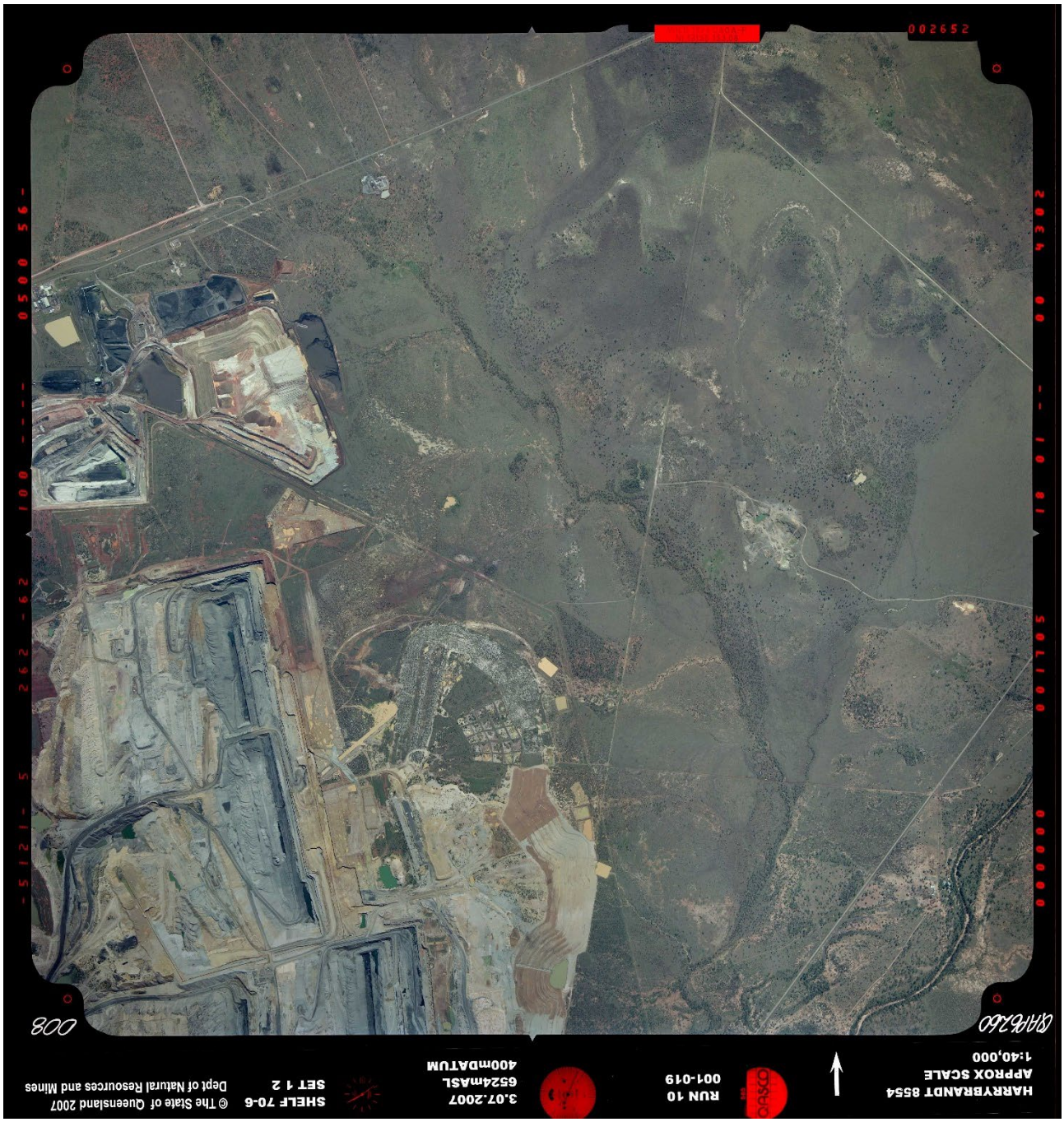
D.3 2007, west. Unmapped Brigalow regrowth, intact



Source: Q Imagery https://qimagery.information.qld.gov.au/

Figure D.4 2007 image, western end of alignment. Unmapped Brigalow regrowth is visible

D.4 2007, east



Source: Q Imagery https://qimagery.information.qld.gov.au/

Figure D.5 2007 image, eastern end of alignment

D.5 2017, west

Source: Q Imagery https://qimagery.information.qld.gov.au/

Figure D.6 2017 image, western end of alignment

D.6 2017, east

Source: Q Imagery https://qimagery.information.qld.gov.au/

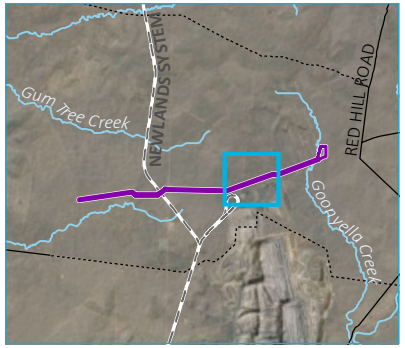
Figure D.7 2017 image, eastern end of alignment

Appendix E

Mapping For Previous Alignment On Lot 411

QUEENSLAND PACIFIC METALS

EMM
creating opportunities



KEY

- March survey area
- Electrical transmission line
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Flora survey sites

- Quaternary assessment
- Habitat assessment

Ground-truthed regional ecosystems (VM status)

- Endangered - remnant
- Endangered - high value regrowth
- Least concern - remnant

Source: EMM (2022); DNRME (2021)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

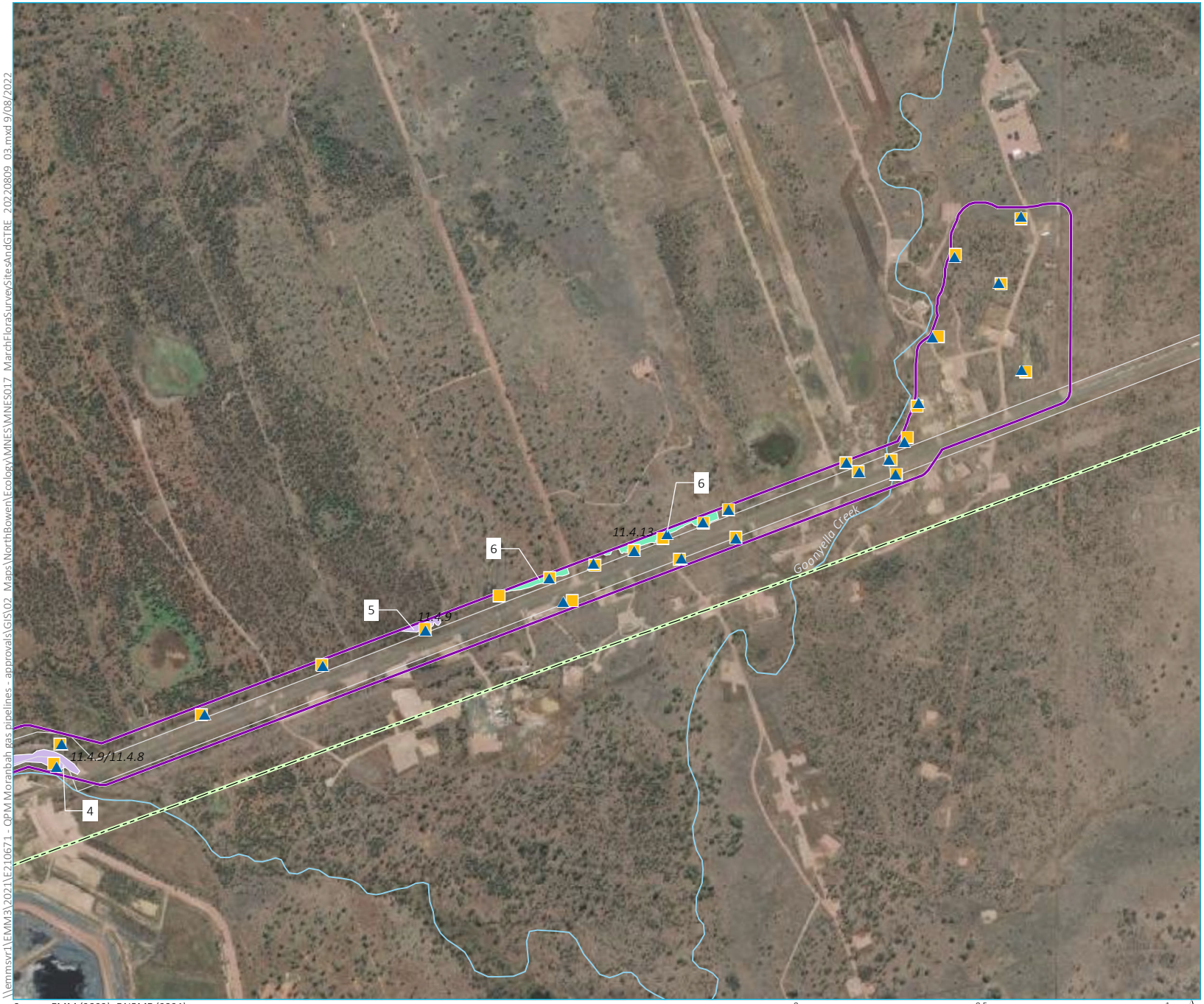
\\emmsvr1\EMM3\2021\E210671 - QPM Moranbah gas pipelines - approvals\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES017 MarchFloraSurveySitesAndGTRE 20220809 03.mxd 9/08/2022

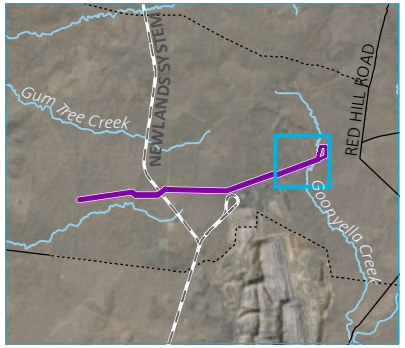
Ground-truthed regional ecosystem and flora survey sites – previous alignment on Lot 411

Map 1 of 2

QPM Energy Project
MNES Assessment Report
Figure E.1

EMM
creating opportunities





KEY

- March survey area
- Electrical transmission line
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Flora survey sites

- Quaternary assessment
- Habitat assessment

Ground-truthed regional ecosystems (VM status)

- Endangered - high value regrowth
- Least concern - remnant

Source: EMM (2022); DNRME (2021)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

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Ground-truthed regional ecosystem and flora survey sites – previous alignment on Lot 411 Map 2 of 2

QPM Energy Project
MNES Assessment Report
Figure E.1

EMM creating opportunities

KEY

- March survey area
- Electrical transmission line
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Fauna survey sites

- Anabat
- Bird survey
- Pitfall trap
- Funnel trap
- Spotlighting transect

Source: EMM (2022); DNRME (2021)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

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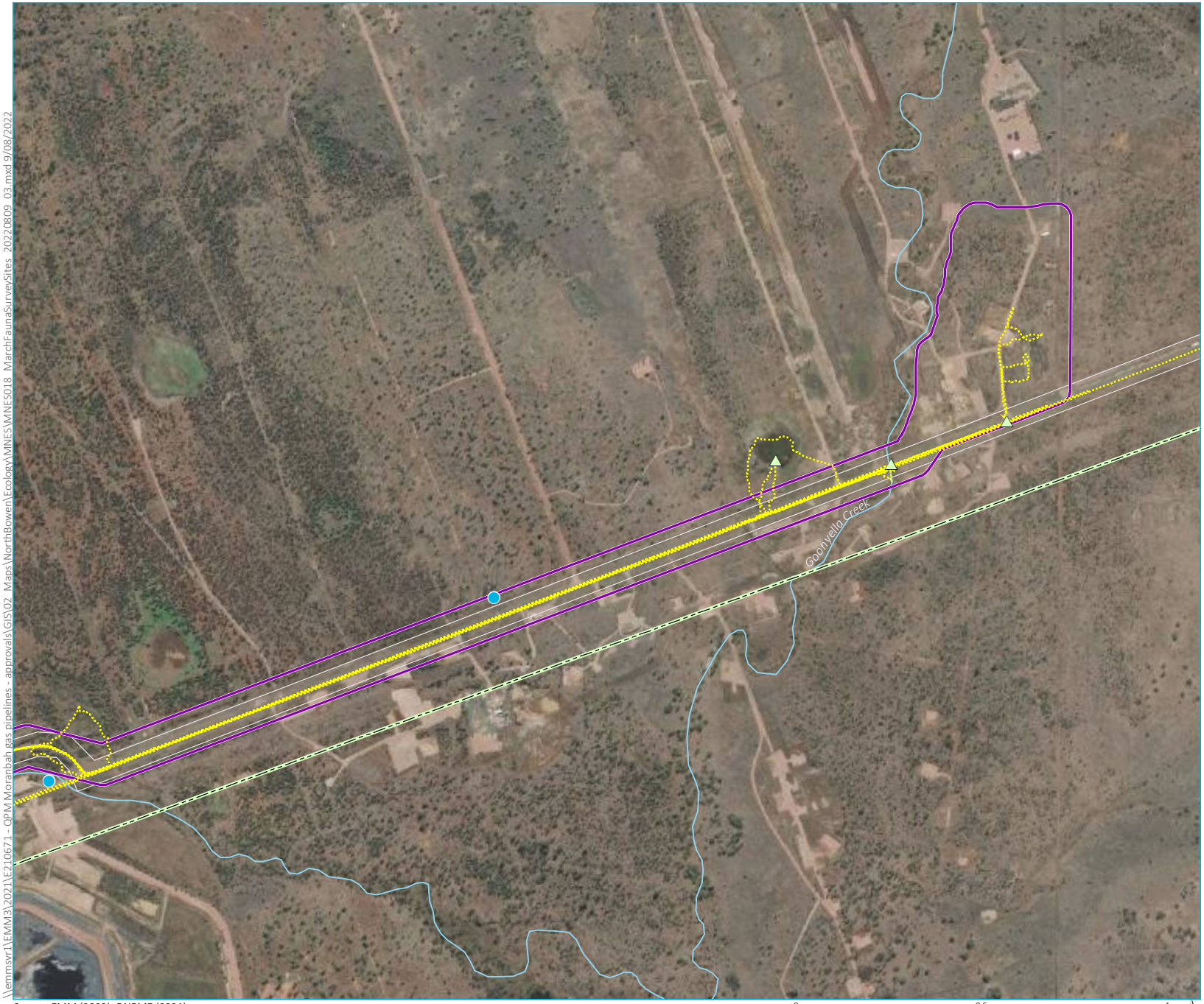
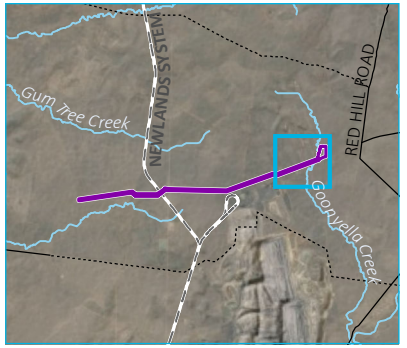
Fauna survey sites – previous alignment on Lot 411 Map 1 of 2

QPM Energy Project
MNES Assessment Report
Figure E.2

EMM creating opportunities





KEY

- March survey area
- Electrical transmission line
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Fauna survey sites

- Anabat
- Bird survey
- Spotlighting transect

Source: EMM (2022); DNRME (2021)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM3\2021\E210671 - QPM Moranbah gas pipelines - approvals\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES018 MarchFaunaSurveySites 20220809 03.mxd 9/08/2022

Fauna survey sites – previous alignment on Lot 411 Map 2 of 2

QPM Energy Project
MNES Assessment Report
Figure E.2

EMM creating opportunities

Appendix F

Species List

QUEENSLAND PACIFIC METALS

EMM
creating opportunities

F.1 Fauna

Table F.1 Fauna species list

Class	Scientific name	Common name
Aves	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater
	*Acridotheres tristis**	Common Myna
	Anthus novaeseelandiae	Australasian Pipit
	Antigone rubicunda	Brolga
	Aprosmictus erythropterus	Red-winged Parrot
	Aquila audax	Wedge-tailed Eagle
	Ardea alba	Great Egret
	Ardea pacifica	White-necked Heron
	Ardeotis australis	Australian Bustard
	Artamus cinereus	Black-faced Woodswallow
	Cacomantis pallidus	Pallid Cuckoo
	Centropus phasianinus	Pheasant Coucal
	Chenonetta jubata	Maned Duck
	Chlamydera maculata	Spotted Bowerbird
	Cincloramphus cruralis	Brown Songlark
	Cincloramphus timoriensis	Tawny Grassbird
	Cisticola exilis	Golden-headed Cisticola
	Colluricincla harmonica	Grey Shrikethrush
	Coracina novaehollandiae	Black-faced Cuckooshrike
	Corvus orru	Torresian Crow
	Coturnix ypsilophora	Brown Quail
	Cracticus nigrogularis	Pied Butcherbird
	Cracticus tibicen	Australian Magpie
	Dacelo novaeguineae	Laughing Kookaburra
	Dendrocygna eytoni	Plumed Whistling Duck
	Dicaeum hirundinaceum	Mistletoebird
	Egretta novaehollandiae	White-faced Heron
	Elanus axillaris	Black-shouldered Kite
	Elseyornis melanops	Black-fronted Dotterel
	Entomyzon cyanotis	Blue-faced Honeyeater

Table F.1 Fauna species list

Class	Scientific name	Common name
	Eolophus rosiecapilla	Galah
	Falco berigora	Brown Falcon
	Falco cenchroides	Nankeen Kestrel
	Gavicalis virescens	Singing Honeyeater
	Geopelia placida	Peaceful Dove
	Geophaps scripta scripta	Squatter Pigeon
	Gerygone olivacea	White-throated Gerygone
	Grallina cyanoleuca	Magpie-lark
	Haliastur sphenurus	Whistling Kite
	Himantopus	Pied Stilt
	Hirundapus caudacutus	White-throated Needletail
	Lalage tricolor	White-winged Triller
	Malurus assimilis	Purple-backed Fairywren
	Malurus melanocephalus	Red-backed Fairywren
	Manorina melanocephala	Noisy Miner
	Merops ornatus	Rainbow Bee-eater
	Microeca fascinans	Jacky Winter
	Milvus migrans	Black Kite
	Myiagra inquieta	Restless Flycatcher
	Myiagra rubecula	Leaden Flycatcher
	Ninox novaeseelandiae	Australian Boobook
	Nymphicus hallandicus	Cockatiel
	Ocyphaps lophotes	Crested Pigeon
	Oriolus sagittatus	Olive-backed Oriole
	Pachycephala rufiventris	Rufous Whistler
	Pardalotus striatus	Striated Pardalote
	Petrochelidon ariel	Fairy Martin
	Philemon corniculatus	Noisy Friarbird
	Platycercus adscitus	Pale-headed Rosella
	Plectorhyncha lanceolata	Striped Honeyeater
	Podargus strigoides	Tawny Frogmouth

Table F.1 Fauna species list

Class	Scientific name	Common name
	Pomatostomus temporalis	Grey-crowned Babbler
	Rhipidura leucophrys	Willie Wagtail
	Scythrops novaehollandiae	Channel-billed Cuckoo
	Smicornis brevirostris	Weebill
	Struthidea cinerea	Apostlebird
	Synoicus ypsilophorus	Brown Quail
	Taeniopygia bichenovii	Double-barred Finch
	Taeniopygia guttata	Zebra Finch
	Turnix pyrrhothorax	Red-chested Buttonquail
	Turnix velox	Little Buttonquail
	Tyto javanica	Eastern Barn Owl
	Vanellus miles	Masked Lapwing
Mammalia	*Aepyprymnus rufescens*	Rufous Bettong
	Hydromys chrysogaster	Water Rat aka Rakali
	Leggadina forresti	Forrest's Mouse
	Lepus europaeus	Brown Hare
	Macropus agilis	Agile Wallaby
	Macropus giganteus	Eastern Grey Kangaroo
	Oryctolagus cuniculus	Rabbit
	Petaurus notatus	Krefft's Glider
	Planigale tenuirostris	Narrow-nosed Planigale
	Chalinolobus gouldii	Gould's Wattled Bat
	Chalinolobus morio	Chocolate Wattled Bat
	Chalinolobus nigrogriseus	Hoary Wattled Bat
	Chalinolobus picatus	Little Pied Bat
	Nyctophilus sp (*N. geoffroyi* or *N. gouldi*)	Lesser Long-eared Bat/Gould's Long-eared Bat
	Scotorepens balstoni	Inland Broad-nosed Bat
	Scotorepens greyii	Little Broad-nosed Bat
	Scotorepens sanborni	Northern Broad-nosed Bat
	Vespadelus troughtoni	Eastern Cave Bat
	Miniopterus australis	Little Bent-wing Bat

Table F.1 Fauna species list

Class	Scientific name	Common name
	Miniopterus orianae oceanensis	Southern Bent-wing Bat
	Chaerephon jobensis	Northern Freetail Bat
	Ozimops lumsdenae	Northern Free-tailed Bat
	Ozimops ridei	Eastern Free-tailed Bat
	Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat
	Taphozous troughtoni	Troughton's Sheathtail Bat
Reptilia	*Amphibolurus burnsi*	Burns' Dragon
	Antaresia maculosa	Spotted Python
	Aspidites melanocephalus	Black-headed Python
	Boiga irregularis	Brown Tree Snake
	Carlia vivax	Lively Rainbow Skink
	Cryptophis boschmai	Carpentaria Snake
	Denisonia maculata	Ornamental Snake
	Diplodactylus platyurus	Eastern Fat-tailed Gecko
	Gehyra dubia	Dubious Dtella
	Heteronotia binoei	Bynoe's Gecko
	Nephurus asper	Prickly Knob-tailed Gecko
	Oedura monilis	Ocellated Velvet Gecko
	Paradelma orientalis	Brigalow Scaly-foot
	Pseudonaja textilis	Eastern Brown Snake
	Strophurus wiliamsi	Eastern Spiny-tailed Gecko
	Suta suta	Curl Snake
	Tropidonophis mairii	Keelback
	Vermicella annulate	Bandy Bandy
Amphibia	*Cyclorana alboguttata*	Green-striped Burrowing Frog
	Cyclorana brevipes	Superb Collared Frog
	Cyclorana novaehollandiae	Eastern Snapping Frog
	Limnodynastes tasmaniensis	Spotted Marsh Frog
	Litoria caerulea	Green Tree Frog
	Litoria latopalmata	Broad-palmed Rocket Frog
	Litoria rubella	Ruddy Tree Frog

Table F.1 Fauna species list

Class	Scientific name	Common name
	Notaden bennettii	Holy Cross Frog
	*Rhinella marina**	Cane Toad

NOTE: Fields in red are Mandatory Fields - all others are desirable but not mandatory.

FIELD	Referral_ID	X	Y	SOURCE_DATUM	PRECISION	YEAR START	MONTH START	DAY START	YEAR END	MONTH END	DAY END	LOCALITY	SCIENTIFIC_NAME	COMMON NAME	SOURCE INSTITUTION	SITE / VISIT IDENTIFIER	ABUNDANCE	BASIS OF RECORD	RECORD TYPE	COMMENTS
DESCRIPTION	EPBC referral number assigned to a case (if known)	Longitude (Decimal degrees)	Latitude (decimal degrees)	Map datum used for the latitude and longitude	Spatial precision in metres - it is an indication of how accurate the record is - e.g. GPS is normally 50m, a map reference is 1000m and a gazetteer record is 5000m)	Year of record or survey start in numeric form (yyyy)	Month of record or survey start in numeric form (mm) eg 3 = March, 12 = December etc	Day of record or survey start in numeric form (dd) i.e 1-31	Year of survey end in numeric form (yyyy). Same as start year if single event.	Month of survey end in numeric form (mm) eg 3 = March, 12 = December etc. Same as start month if single event.	Day of survey end numeric form (dd) i.e. 1-31. Same as start day if single event.	Location where taxon was recorded	Scientific name (Genus species subspecies/variety where available)	Common name for the species	Enter the name of the institution or company i(n full where possible) which collected the data e.g. Australian Museum, BHP etc	Unique visit/survey number	Number of taxa counted or trapped; for presence only leave blank	The way the species was detected: e.g.sighting , heard call, evidence - scats, acoutistic recording, thermal imaging, imagery - drone etc	The type of record: Survey, Incidental, Specimen	Any special comments, including on weather, type/frequency of survey, plot size, etc.
DATA FORMAT	Text (15)	Double (11,8) i.e. 8 decimal places	Double(11,8)	Text	Integer	Integer (4)	Integer (2)	Integer (2)	Integer (4)	Integer (2)	Integer (2)	Text (500)	Text	Text	Text	Text	Integer	Text	Text	Text
	EPBC 2022/09329	147.9925134	-21.6491737	GDA94	50	2021	12	8	2021	12	8	near North Goonyella, Moranbah	Hirundapus caudacutus	White-throated Needletail	EMM Consulting Pty Ltd	EMM QPM Pipe Dec 21	12	Sighting	Survey	
	EPBC 2022/09329	147.9033454	-21.66959967	GDA94	50	2022	3	9	2022	3	9	near North Goonyella, Moranbah	Geophaps scripta scripta	Squatter Pigeon	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	2	Sighting	Survey	
	EPBC 2022/09329	147.907667	-21.67135968	GDA94	50	2022	3	9	2022	3	9	near North Goonyella, Moranbah	Geophaps scripta scripta	Squatter Pigeon	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.903333	-21.66976437	GDA94	50	2022	3	9	2022	3	9	near North Goonyella, Moranbah	Geophaps scripta scripta	Squatter Pigeon	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	8	Sighting	Survey	
	EPBC 2022/09329	147.9043782	-21.6713382	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Geophaps scripta scripta	Squatter Pigeon	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	5	Sighting	Survey	
	EPBC 2022/09329	147.9034187	-21.66737727	GDA94	50	2022	6	27	2022	6	27	near North Goonyella, Moranbah	Geophaps scripta scripta	Squatter Pigeon	EMM Consulting Pty Ltd	EMM QPM Pipe Jun 22	4	Sighting	Survey	
	EPBC 2022/09329	147.9020909	-21.66332597	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.914597	-21.66455247	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9267072	-21.66193585	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9394044	-21.66222725	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9245882	-21.66201525	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9234968	-21.6629231	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9283739	-21.66196358	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9298231	-21.66190058	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9341818	-21.66203536	GDA94	50	2022	3	10	2022	3	10	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9441734	-21.6625094	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9427485	-21.66225668	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9418292	-21.6621794	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9382152	-21.6620781	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9367313	-21.66208885	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9356473	-21.66202263	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9351985	-21.66210022	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9346933	-21.66235304	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9346124	-21.66209806	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9343261	-21.66209459	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9342263	-21.66214106	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9342126	-21.66210855	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9338369	-21.66227591	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9329087	-21.66192806	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9324511	-21.66058274	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9397243	-21.66230543	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.940732	-21.66242711	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9432649	-21.66273149	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9447779	-21.66205395	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9440704	-21.66232434	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9375601	-21.66247297	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9351958	-21.662041	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9342371	-21.66196892	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9334052	-21.65943213	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9323171	-21.66120841	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9298358	-21.66213606	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9312409	-21.66234298	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9393229	-21.66224035	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9396858	-21.66229049	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9433325	-21.66269127	GDA94	50	2022	3	11	2022	3	11	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Mar 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9506532	-21.64101019	GDA94	50	2022	11	21	2022	11	21	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Nov 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9506377	-21.64338152	GDA94	50	2022	11	21	2022	11	21	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Nov 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9507102	-21.64475593	GDA94	50	2022	11	21	2022	11	21	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Nov 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9498316	-21.64590286	GDA94	50	2022	11	21	2022	11	21	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Nov 22	1	Sighting	Survey	
	EPBC 2022/09329	147.9503012	-21.64599253	GDA94	50	2022	11	21	2022	11	21	near North Goonyella, Moranbah	Denisonia maculata	Ornamental Snake	EMM Consulting Pty Ltd	EMM QPM Pipe Nov 22	1	Sighting	Survey	

Appendix G

Microbat Call Analysis

QUEENSLAND PACIFIC METALS

EMM
creating opportunities

Microbat Call Identification Report

Prepared for ("Client"):	EMM Consulting
Survey location/project name:	Moranbah, Qld
Survey dates:	7-11 March 2022
Client project reference:	
Job no.:	EMM-2203
Report date:	3 June 2022

Methods

Data received

Balance! Environmental received 15 raw ZCA data files, recorded on three Anabat Express detectors, over five consecutive nights (7th – 11th March 2022) in the Moranbah area of central Queensland. Seven separate sites were surveyed (see **Figure 1**), with one site sampled for five nights (detector EMMBRIS2), four sites for two nights and two sites for 1 night (see **Table 1**).

Call analysis and identification

The data were processed in *Anabat Insight* (Version 2.0.2; Titley Scientific, Brisbane). The ZCA data files were converted to bat-call sequence files (ZC files) and then all ZC files were scanned with a generic noise filter to separate files containing only non-bat background noise from those with potentially identifiable bat calls.

All files that passed the noise filter (*i.e.,* contained bat calls) were processed through a Decision Tree analysis to group calls with similar pulse characteristics (*e.g.*, characteristic frequency, slope, duration) and apply tentative species labels. Each "species" group was then reviewed manually by comparing call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (*e.g.,* Reinhold *et al.* 2001; Milne 2002). Due to the large size of the dataset, once all potential species in each group were identified and representative calls labelled for each site, the remaining calls in the group retained only the group label.

The likelihood of species' occurrence in the study area was confirmed by referring to the Australasian Bat Society's *BatMap* application (ABS 2021) and other published distribution information (*e.g.,* Churchill 2008; van Dyck *et al.* 2013).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Armstrong *et al.* (2020).

Table 1 Bat detector deployment schedule for the QPM Moranbah survey.
GPS coordinates derived from detector metadata.

Detector	Serial Number	Dates	Latitude	Longitude
EMMBRIS1	SN628202	7-8 March	-21.66145	147.9531
		9-10 March	-21.6623	147.9403
		11-Mar	-21.6457	148.0009
EMMBRIS2	SN628201	7-11 March	-21.6472	147.99684
EMMBRIS3	SN628205	7-8 March	-21.6471	147.9938
		9-10 March	-21.66865	147.9027
		11-Mar	-21.6636	147.9501

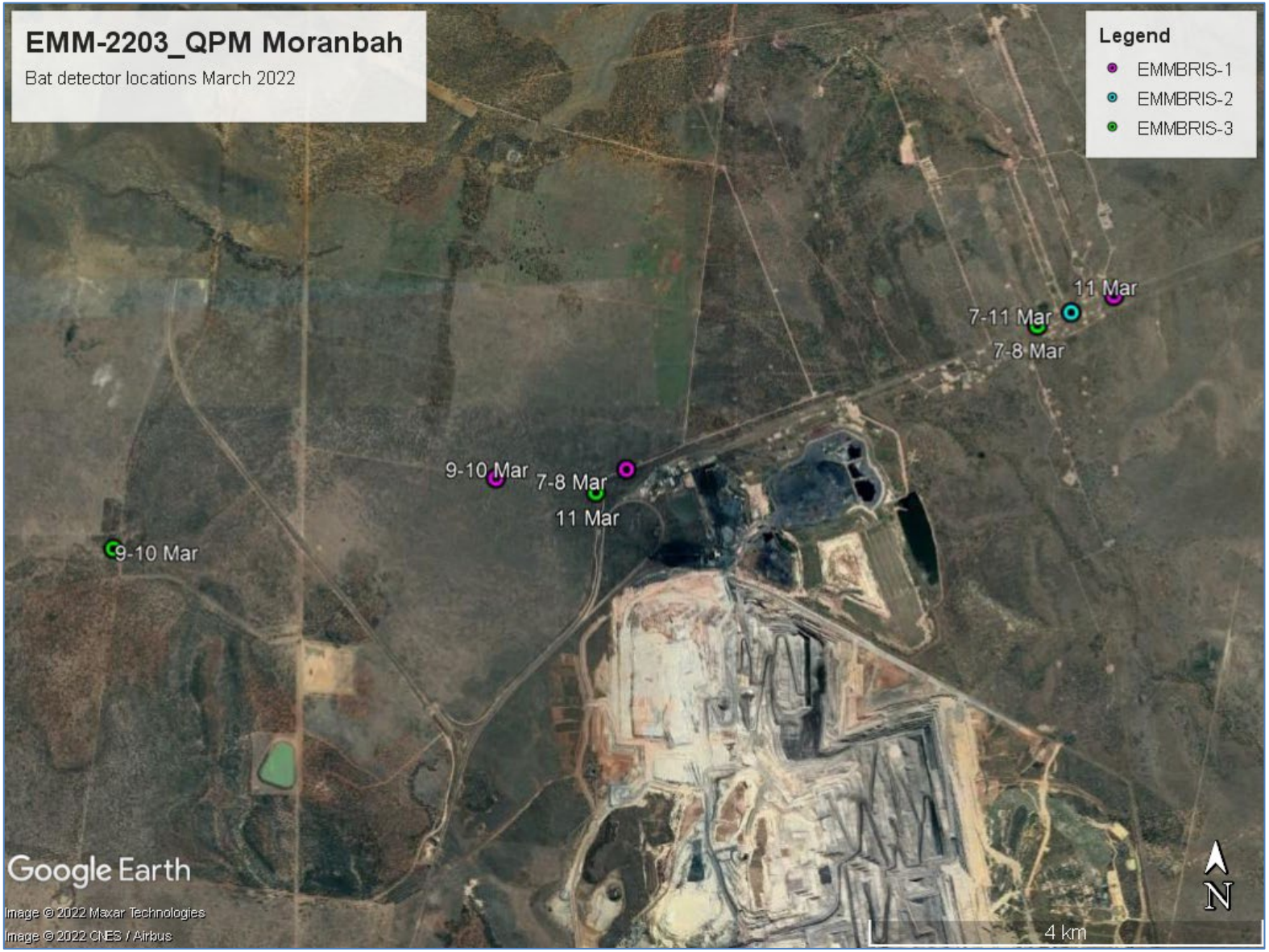


Figure 1 Bat detector deployment sites, QPM Moranbah, 7-11 March 2022.

Table 2 Bats detected during the QPM Moranbah acoustic survey, 7-11 2022.

♦ = Definite at least one call from the site was unequivocally attributed to the species

□ = Possible calls like those from the species were recorded but could not be reliably identified

Detector:	EMMBRIS-1			EMMBRIS-2	EMMBRIS-3		
Nights:	7-8 Mar	9-10 Mar	11 Mar	7-11 Mar	7-8 Mar	9-10 Mar	11 Mar
Chalinolobus gouldii	♦	♦	♦	♦	♦	♦	♦
Chalinolobus morio	♦			□	♦	♦	
Chalinolobus nigrogriseus	□			♦	♦	♦	
Chalinolobus picatus	♦	♦	♦	♦	♦	♦	♦
Nyctophilus sp.	♦			♦			♦
Scotorepens balstoni	♦	□	♦	♦	♦	□	♦
Scotorepens greyii	♦			♦	♦	♦	□
Scotorepens sanborni	♦	♦	□	♦	♦	♦	□
Vespadelus finlaysoni				□			
Vespadelus troughtoni	♦		♦	♦	♦	♦	
Vespadelus vulturnus / V. baverstocki				□	□		
Miniopterus australis				♦			
Miniopterus orianae oceanensis	□			♦			
Chaerephon jobensis	♦	♦	♦	♦	♦	♦	♦
Ozimops lumsdenae	♦	♦	♦	♦	♦	♦	♦
Ozimops ridei	♦	♦	♦	♦	♦	♦	♦
Saccolaimus flaviventris	♦	♦	♦	♦	♦	♦	♦
Taphozous troughtoni	♦			□		□	

Results

The ZCA conversion and noise filtration process yielded a dataset of 17,605 ZC files containing identifiable bat calls. Within that data, a total of 4344 calls were identified, either to distinct species (3598 calls) or to undifferentiated species pairs where call characteristics precluded reliable species attribution (745 "unresolved calls").

Most (>3000) of the calls selected for analysis were recorded at just two sites: the western-most site beside a dam (EMMBRIS-3, 9-10 March); and adjacent to a bridge/large-culvert under the North Goonyella Mine Access Road (EMMBRIS-2, 7-11 March). In both cases, a significant portion of the calls were typical of bats flying in highly cluttered airspace, often with multiple individuals recorded in the same file. In the case of the bridge/culvert site, many of these calls appear to be from "cave-dependent" bats (*e.g.*, *Vespadelus troughtoni, Miniopterus* spp.) that may be roosting in the structure. The abundant clutter-adapted calls at the dam site are characteristic of numerous individuals of multiple species drinking at and/or foraging over the dam.

Table 2 provides an overview of the species detected at each site and example spectrograms for each identified species appear in **Appendix 1**. **Appendix 2** gives a full breakdown of the numbers of calls recorded per site for each species or unresolved species group.

At least 16 and up to 19 species were detected during the survey. Fifteen call types were positively attributed to individual species, while one additional type was reliably allocated to the *Nyctophilus* genus, two species of which potentially occur in the study area: *N. geoffroyi* and *N. gouldi*.

Most of the unresolved calls were assigned to eight undifferentiated pairs of species that were otherwise positively identified from more definitive calls (see lower section of table in **Appendix 2**). Where such unresolved calls were identified, but one or more pair members were not also positively identified, those species are shown as "possible" in **Table 2**.

Four unresolved call types (261 calls) potentially represent two additional species records for the survey. All but one of these calls was recorded at the bridge/culvert site, the exception being a call detected near a dam (EMMBRIS-3, 7-8 March), approximately 300m west of the bridge/culvert site.

Most (239) of the bridge/culvert site calls were probably made by *V. troughtoni* flying in proximity to the apparent roost site, but it is possible some calls in this group belonged to *Vespadelus finlaysoni*, another cave-dependent species, which is usually associated with more westerly regions. Similarly, another 17 calls were thought to potentially be from either *V. finlaysoni* or *Miniopterus australis*.

Four calls from the bridge/culvert site showed characteristics intermediate between the calls of *Miniopterus orianae oceanensis* and two other *Vespadelus* species (*V. vulturnus / V. baverstocki*). It is probable that these were roost exit/approach call variants of *M. o. oceanensis*, from which several calls were positively identified; however, some pulse sequences were remarkably similar to *Vespadelus* spp.

The single call from the dam west of the bridge/culvert was almost certainly a *Vespadelus* sp. call, but with lower frequency (~47 kHz) than typically recorded from *V. troughtoni*. Calls of this type are generally made by *V. vulturnus* in southern inland Queensland or by *V. baverstocki* in the southern Northern Territory. The latter species is shown as occurring within 50km of the study site (ABS 2021), so it is possible this call belongs to *V. baverstocki*.

References

ABS (2021). Australasian Bat Society – *BatMap*; https://www.ausbats.org.au/batmap.html; accessed 4/8/2021

Armstrong, K.N., Reardon, T.B., and Jackson, S.M. (2020). A current taxonomic list of Australian Chiroptera. *Australasian Bat Society*. Version 2020-06-09. URL: http://ausbats.org.au/species-list/4593775065

Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.

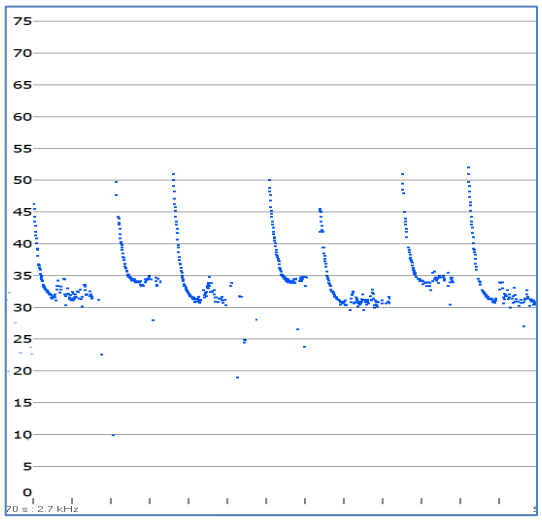
Milne, D.J. (2002). *Key to the Bat Calls of the Top End of the Northern Territory*. Technical Report No. 71, Parks and Wildlife Commission of the Northern Territory, Darwin.

Reardon, T. (2003). Standards in bat detector based surveys. *Australasian Bat Society Newsletter* **20**, 41-43.

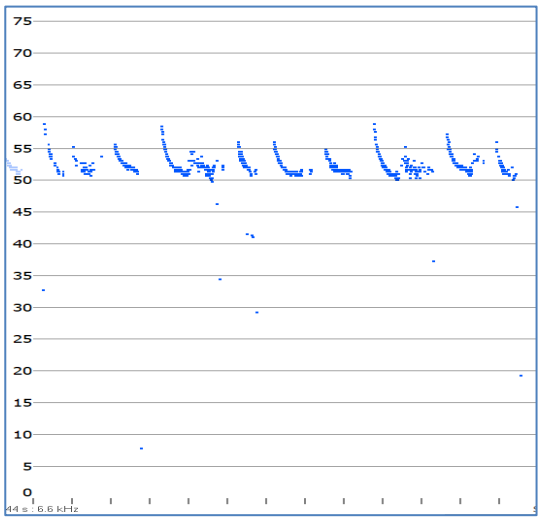
Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Department of Natural Resources and Mines, Brisbane.

van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). Field Companion to the Mammals of Australia. New Holland; Sydney.

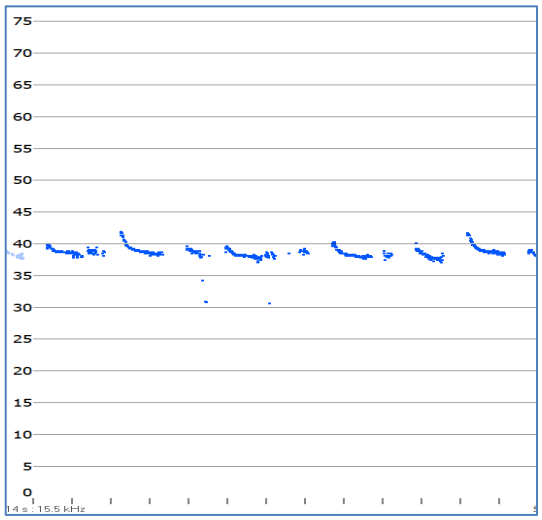
Appendix 1 Representative bat-calls recorded during the Moranbah survey, 7-11 March 2022. Time between pulses removed; time-scale (*x*-axis) 10ms per tick



Chalinolobus gouldii



Chalinolobus morio



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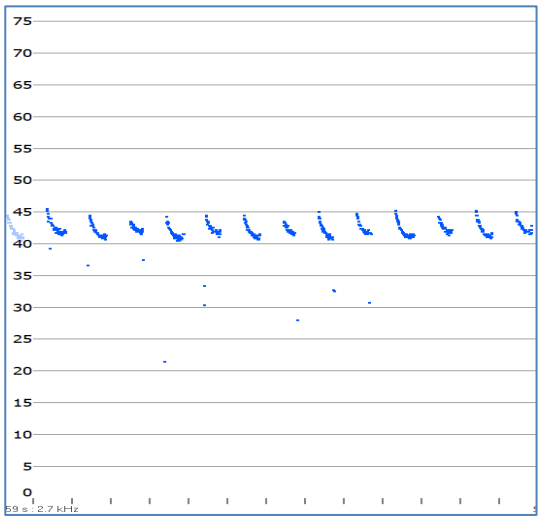
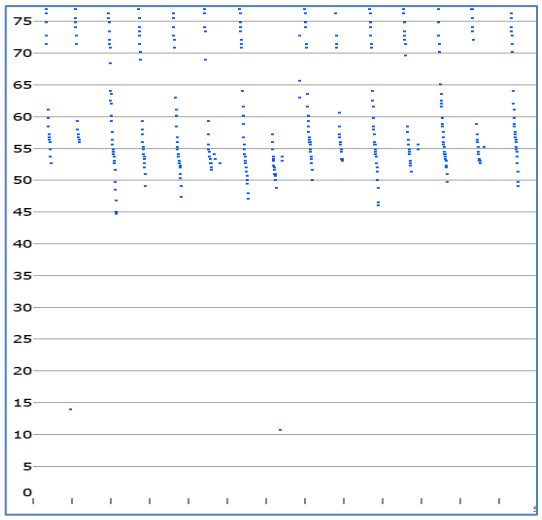
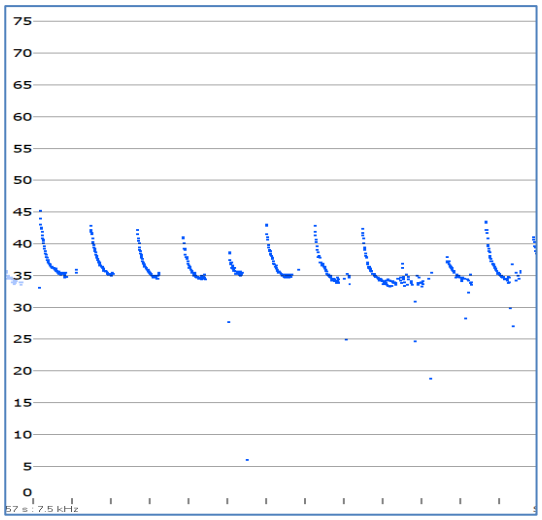


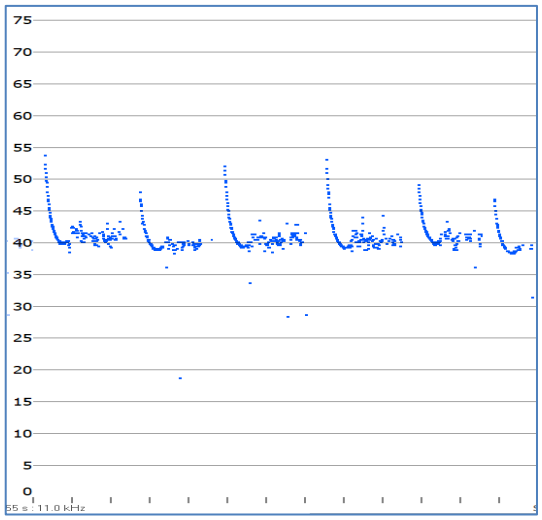
Chalinolobus picatus



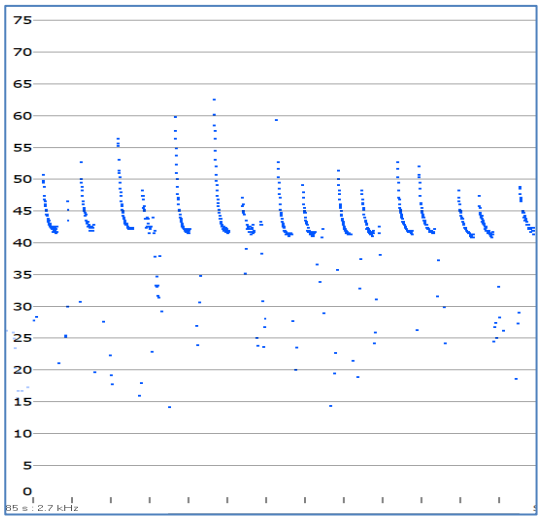
Nyctophilus sp.



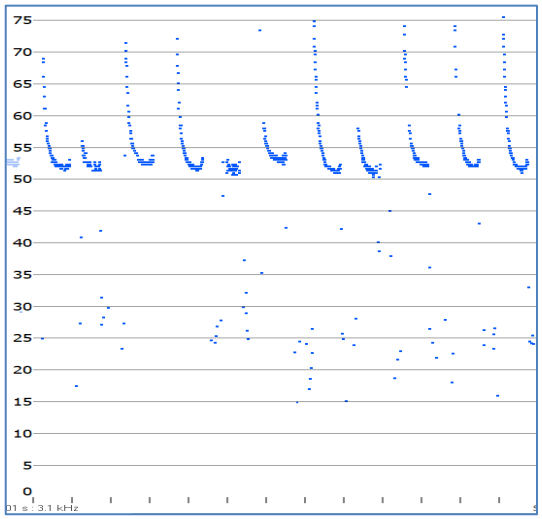
Scotorepens balstoni



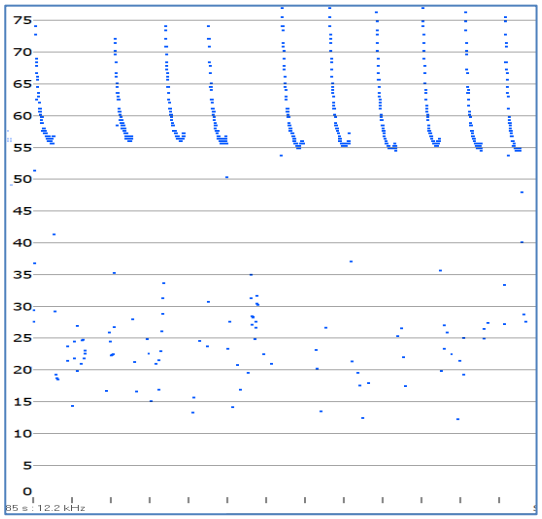
Scotorepens greyii



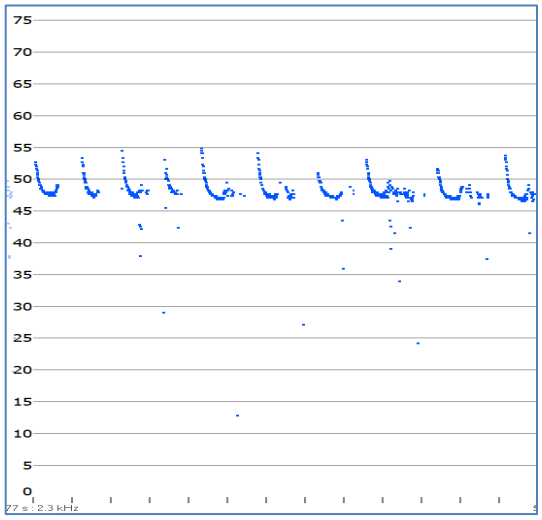
Scotorepens sanborni



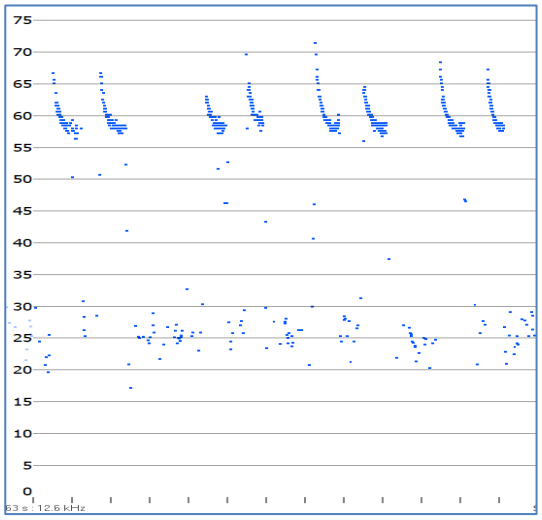
Vespadelus troughtoni



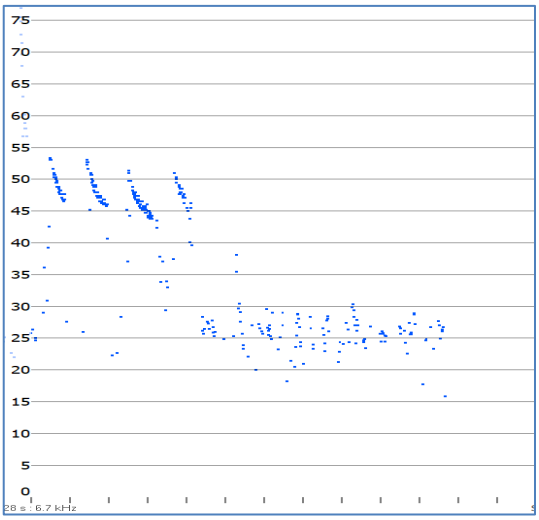
V. troughtoni or *V. finlaysoni*



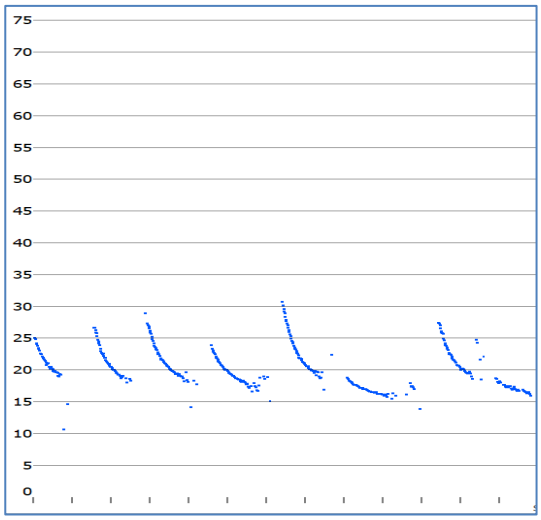
V. troughtoni or *V. vulturnus* or *V. baverstocki*



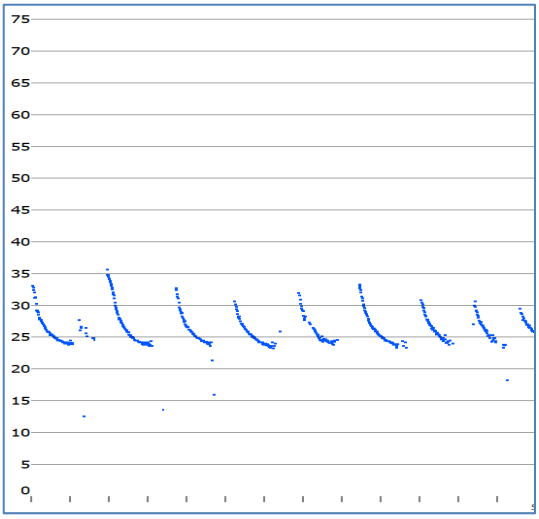
Miniopterus australis



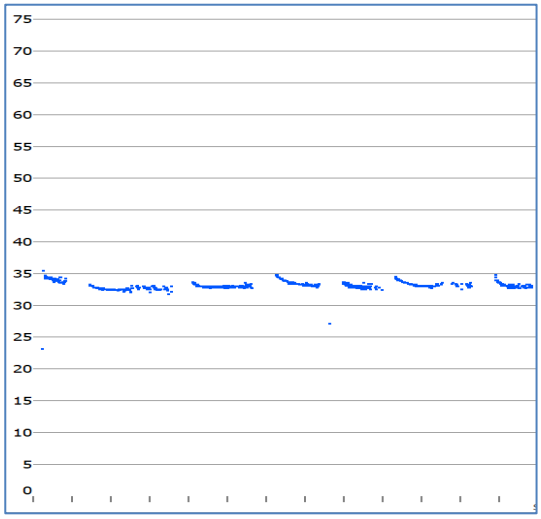
Miniopterus orianae oceanensis



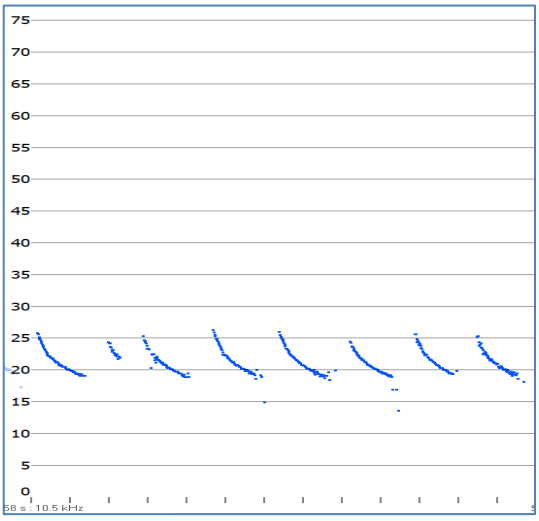
Chaerephon jobensis



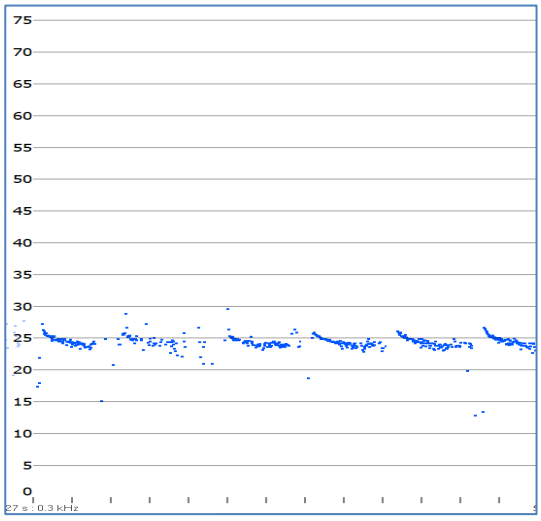
Ozimops lumsdenae



Ozimops ridei



Saccolaimus flaviventris



Taphozous troughtoni

Appendix 2 Bats recorded during the QPM Moranbah acoustic surveys, 7-11 March 2022
Count of calls allocated per species or unresolved group per site.

Detector:	EMMBRIS1			EMMBRIS2	EMMBRIS3			Species Total
Nights:	7-8 Mar	9-10 Mar	11 Mar	7-11 Mar	7-8 Mar	9-10 Mar	11 Mar	
Positively identified calls								
Chalinolobus gouldii	45	9	8	75	192	221	11	561
Chalinolobus morio	1				3	4		8
Chalinolobus nigrogriseus				1	17	2		20
Chalinolobus picatus	9	1	1	9	21	31	2	74
Nyctophilus sp.	1			18			1	20
Scotorepens balstoni	3		1	2	33		1	40
Scotorepens greyii	1			6	17	2		26
Scotorepens sanborni	14	1		41	40	118		214
Vespadelus troughtoni	31		2	926	191	201		1349
Miniopterus australis				5				5
Miniopterus orianae oceanensis				11				11
Chaerephon jobensis	32	6	3	13	26	490	4	574
Ozimops lumsdenae	10	1	1	11	37	116	1	177
Ozimops ridei	3	2	7	1	29	34	4	80
Saccolaimus flaviventris	143	10	7	64	86	123	2	435
Taphozous troughtoni	4							4
Unresolved calls								
C. gouldii / O. ridei	7		3		17	27	2	56
C. gouldii / S. balstoni	4	2			1	6	2	15
C. morio / V. troughtoni	1			23	20	8		52
C. nigrogriseus / S. greyii	1			1	16	14		32
C. picatus / S. sanborni	23		1	53	42	55	1	175
S. greyii / S. sanborni	2			2	27	5	1	37
V. troughtoni / V. finlaysoni				239				240
V. troughtoni / V. vulturnus / V. baverstocki					1			1
M. australis / Vespadelus sp.				17				17
M. o. oceanensis / Vespadelus sp.	1			4				5
O. lumsdenae / T. troughtoni	1			2		5		8
S. flaviventris / C. jobensis	11	5		5	13	64	9	107
Site Total	348	37	34	1529	829	1526	41	4344

Appendix H

Vegetation Management Plan

QUEENSLAND PACIFIC METALS

EMM
creating opportunities

Vegetation Management Plan

QPM Energy Project

Prepared for QPM Energy Pty Ltd

March 2023

Vegetation Management Plan

QPM Energy Project

QPM Energy Pty Ltd

E221165 RP1

March 2023

Version	Date	Prepared by	Approved by	Comments
V1	26 January 2023	Anna McRae	Susan Lodge	Draft
V2	9 February 2023	Anna McRae	Susan Lodge	Final

Approved by

Susan Lodge
Associate Environmental Consultant
9 February 2023

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Spring Hill QLD 4000

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Abbreviations

The following abbreviations are used in this report:

Abbreviations used in this report

Abbreviation	Term
AHD	Australian Height Datum
AS	Australian Standard
BS Act	*Biosecurity Act 2014*
BPESC	Best Practice Erosion and Sediment Control
CEEVNT	Critically Endangered, Endangered, Vulnerable and Near Threatened
cm	Centimetre
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science
DoR	Department of Resources
EA	Environmental Authority
EMM	EMM Consulting Pty Ltd
EMP	Environmental Management Plan
EO Act	*Environmental Offsets Act 2014*
EO Regulation	Environmental Offsets Regulation 2014
EP Act	*Environmental Protection Act 1994*
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
ERA	Environmentally Relevant Activity
ESCP	Erosion and Sediment Control Plan
EVNT	Endangered, vulnerable or near threatened
FMP	Fauna Management Plan
GBO	General biosecurity obligation
GCF	Gas Compression Facility
ha	Hectare
HVR	High value regrowth
IECA	International Erosion Control Association
km	Kilometres
LGA	Local government area
m	Metres
MNES	Matters of National Environmental Significance

Abbreviations used in this report

Abbreviation	Term
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992*
NQGP	North Queensland Gas Pipeline
QEOP	*Queensland Environmental Offsets Policy V1.6*
QPM	Queensland Pacific Metal Pty Ltd
RE	Regional ecosystems
ROW	Right of way
SEVT	Semi-evergreen vine thicket
TEC	Threatened ecological communities
TECH	Townsville Energy Chemicals Hub
VM Act	*Vegetation Management Act 1999*
VMP	Vegetation Management Plan
WoNS	Weed of National Significance
WHS	Workplace Health and Safety

1 Introduction

1.1 Background

Queensland Pacific Metals (QPM) Energy is the proponent of the QPM Energy Project (the Project). The Project involves the design, construction, and operation of a gas compression facility (GCF) and a high-pressure pipeline that links the proposed GCF to the nearby existing and operational North Queensland Gas Pipeline (NQGP).

The Project proposes to collect waste coal mine gas at the proposed GCF via waste gathering lines from existing adjacent mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP. The NQGP will then transport the compressed gas north to Townsville, where it will be depressurised and distributed, by a third party, to industrial users, including QPM's Townsville Energy Chemicals Hub (TECH) Project.

EMM Consulting Pty Limited (EMM) has been commissioned to undertake ecological assessments for the Project including the identification of environmental matters prescribed at Commonwealth and State levels across the Project area and associated impact assessments. EMM has been working with QPM Energy and has contributed to the Project design including identification of appropriate mitigation measures to reduce environmental impacts and maximise beneficial environmental outcomes.

1.2 Purpose of this report

The purpose of this Vegetation Management Plan (VMP) is to establish an environmental framework for managing impacts on native vegetation during the design, construction, and operational phases of the Project. This VMP aims to:

- Assess the potential impacts of the Project on native vegetation communities and threatened flora species identified in the Matters of National Environmental Significance (MNES) Assessment Report (EMM 2022) that may be at risk from the Project.
- Provide recommendations for avoidance, mitigation and management of potential impacts to maintain these ecological values associated with native vegetation in the Project area.

1.3 Project details

1.3.1 Project area

The Project is proposed 43 km north of Moranbah, a coal mining town and locality within the Isaac Regional Council local government area (LGA).

The region is heavily disturbed with extensive mining (both open cut and underground) and grazing activities throughout.

The proposed high-pressure pipeline is situated over two properties, comprising the following lot/plans:

- Lot 23 on SP262530, herein named Lot 23 (Denham Park)
- Lot 11 on SP262530, herein named Lot 11 (Denham Park)
- Lot 2 on SP214117, herein named Lot 2 (Dabin Station).

The high-pressure pipeline also crosses (via underboring, with no surface impacts):

- Lot 100 on SP235905 (operational railway, Goonyella System)
- the Sunwater Moranbah and Eungella pipelines.

The Project area also includes a 40 m buffer from the proposed high-pressure pipeline corridor which is 30 m in width (total width surveyed along the alignment is 110 m). This buffer also intersects a small portion of Lot 14 on CP846391 (Burton Downs), herein named Lot 14, as well as Lots 23, 11 and 2.

The proposed GCF and access road are located on Lot 2, and is also buffered by 40 m, for the purpose of the ecological assessment.

Additionally, a 20 km buffer from the project area has been applied and is referred to as the study area.
The project area is shown on Figure 1.1.

For the purpose of this report, the following definitions are used:

- Project footprint – the location of the proposed pipeline, GCF and ancillary facilities and the area which will be directly disturbed by the project.
- Project area – is the project footprint within a 40m buffer from the pipeline corridor, GCF and access track.
- Study area – 20 km buffer from the project footprint.

1.3.2 Project components

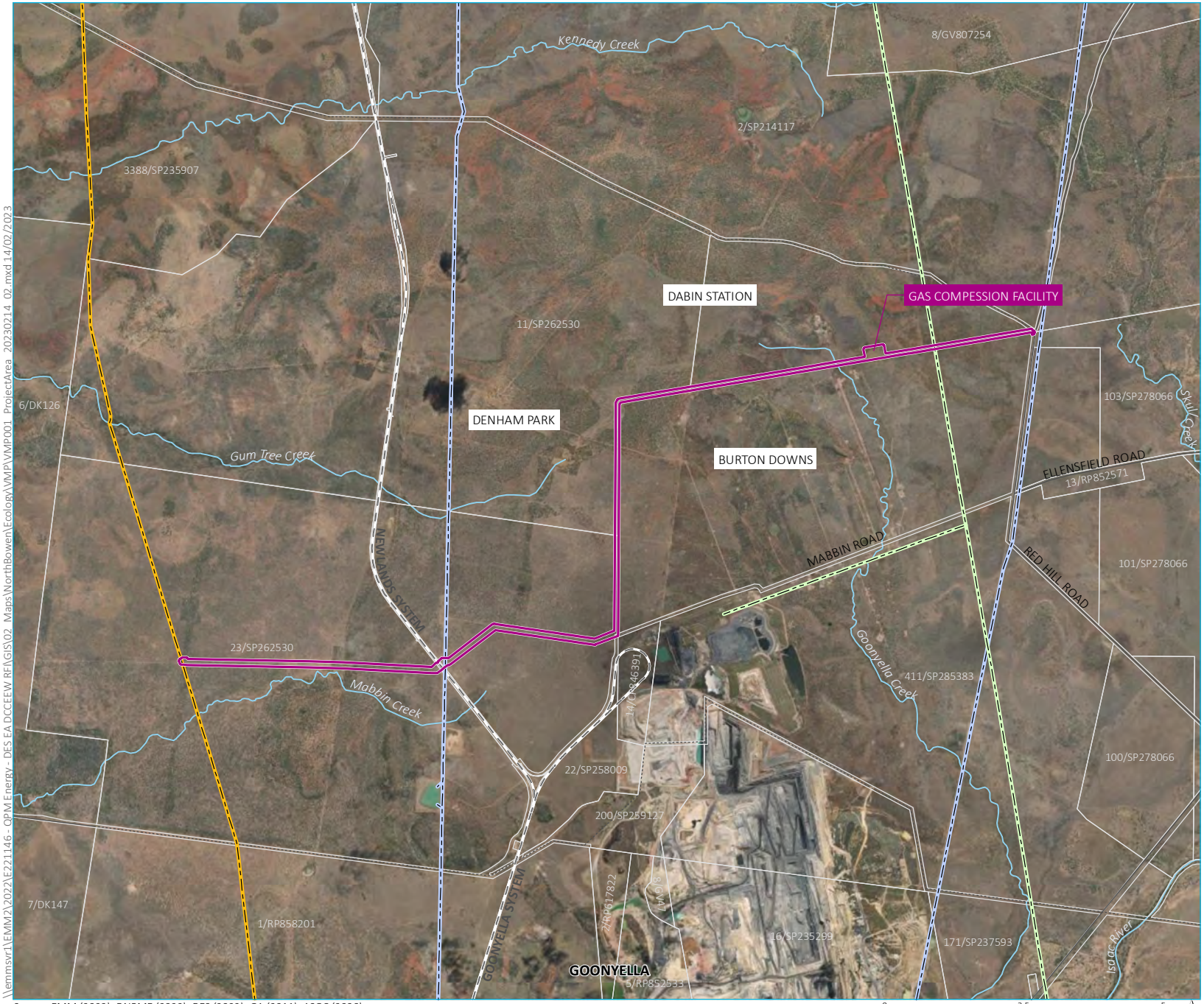
Table 1.1 describes the key components of the Project.

Table 1.1 Project components

Component	Description
Gas Compression Facility	• Captures and converts waste coal mine gas to clean gas. • Proposed to be located at Dabin Station on the southern boundary of Lot 2 SP214117 and 2.7 km west of the Red Hill Road reserve. • Sited on a 200 m by 300 m area. • 6 ha disturbance footprint.
High-pressure pipeline	• High-pressure pipeline to transport clean gas from the GCF to the NQGP. • 16.8 km in length, running along cleared areas, fence lines and fire breaks along property boundaries. • During construction, a 30 m wide construction right of way (disturbance area of 51 ha). • During operations, a 15 m wide operating easement (disturbance area of 25 ha) from 3.2 km from the GCF.
Access road	• Road to provide all-weather access to the GCF from Red Hill Road reserve. • 2.8 km long and 30 m wide. • 8 ha disturbance footprint

The Project is defined by limits which include:

- road connection to Red Hill Road
- GCF inlet flange/s to the facility from gas gathering systems on adjacent mining tenures
- connection to the NQGP (via hot tap)
- GCF clean water pipeline flange returning water to the relevant existing mine water management systems
- rainfall run-off from an on-site settling basin
- high-pressure pipeline easements (30 m wide right of way (ROW) during construction and reduced to 15 m ROW during operations from 3.2 km from the GCF boundary).



KEY

- Project area
- Electrical transmission line
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary

INSET KEY

- Main road
- National park
- State forest

Project area

QPM Energy Project
Vegetation Management Plan
Figure 1.1

creating opportunities

Source: EMM (2023); DNRME (2022); DES (2022); GA (2011); ASGC (2006)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\VMP\VMP001 ProjectArea 20230214 02.mxd 14/02/2023

2 Legislation

Primary approvals for the Project are being sought under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environment Protection Act 1994* (QLD) (EP Act). These approval processes are being progressed concurrently.

A summary of the key legislation, policies and guidelines that have informed the design and implementation of field ecology surveys and impact assessments is provided in the following sections.

2.1 Commonwealth

2.1.1 *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act)

The EPBC Act is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places — defined in the EPBC Act as MNES.

There are known MNES within the Project area. A referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (EPBC2022/09329) was lodged in October 2022. The Project was determined to be a controlled action and for assessment via the preliminary documentation pathway.

2.1.2 EPBC Act Environmental Offsets Policy

Environmental offsets are required to be delivered in accordance with the EPBC Act Environmental Offsets Policy (DoEE 2012). The Environmental Offsets Policy outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the EPBC Act. Offsets are defined as measures that compensate for the residual adverse impacts of an action on the environment. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act (DoEE 2012).

Avoidance and mitigation measures are the primary strategies for managing the potential significant impact of a proposed action. Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any residual significant impact. Where significant impacts are found to occur to MNES, and environmental offsets are required, an offsets package should be provided. An offsets package is a suite of actions that a proponent undertakes in order to compensate for the residual significant impacts to the identified MNES. It can comprise a combination of direct offsets and other compensatory measures.

Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain (DoEE 2012). To support any offset assessments that may be required it will be important to evaluate the specific MNES attributes that occur within the proposed disturbance area (e.g. whether foraging habitat or breeding habitat) and the habitat quality of mapped habitat areas. This information is required to inform offset calculations.

2.2 State

2.2.1 Environmental Protection Act 1994

The Project will require a material change of use for an environmentally relevant activity (ERA). The ERA will require an environmental authority (EA) to be issued under the *Environmental Protection Act 1994* (QLD) (EP Act). As part of the application, an environmental impact assessment is required to be undertaken to assess the potential for environmental impacts, and identify how those impacts will be avoided, reduced and mitigated. As part of the impact assessment, the presence of matters of state environmental significance (MSES) within the proposed impact areas will need to be identified, and determination made as to whether the proposed actions would result in a 'significant' residual impact to MSES.

If a significant impact is considered likely to occur to MSES, environmental offsets will be conditioned through the EA, and they will need to be delivered in accordance with the *Environmental Offsets Act 2014* (EO Act). This will be assessed applying the *Significant Residual Impact Guideline* (DEHP 2014).

2.2.2 Vegetation Management Act 1999

The purpose of the *Vegetation Management Act 1999* (VM Act) is to regulate the clearing of native vegetation in a way that conserves remnant vegetation in declared areas, ensures clearing does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes.

Under the VM Act regional ecosystems (REs) are assigned one of three statuses which are:

- Endangered RE
- Of Concern RE, or
- Least Concern RE.

These statuses are taken from the RE description database, and respective definitions are provided in the Act. Both VM Act status and biodiversity status of REs have been included.

2.2.3 Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) provides for the gazettal of protected areas including nature refuges, prescribes classes of wildlife and sets out restrictions on the taking or harm to native wildlife without a valid permit. As part of the MNES impact assessment (EMM 2022), threatened flora and fauna species have been assessed in terms of those with potential to occur in the Project area, and habitat mapping prepared.

i Protected plants trigger mapping

In Queensland, all plants that are native to Australia are protected plants under the NC Act to prevent whole plants or protected plant parts from being illegally removed from the wild or illegally traded. Clearing, growing, harvesting and trading of protected plants in Queensland is regulated by the Nature Conservation (Wildlife Management) Regulation 2006.

If a proposed area to be cleared contains native plants in the wild, and there is no relevant exemption, and the area is shown as 'high risk' on the flora survey trigger map, a flora survey of the clearing impact area and 100 m buffer must be undertaken prior to any clearing. If the flora survey identifies the presence of an endangered, vulnerable or near threatened (EVNT) plants in the clearing impact area, or 100 m buffer, a clearing permit under NC Act is required prior to any clearing. A clearing permit authorises the clearing of an area of land rather than the individual species of plant present. Clearing that has complied with a permit will not be subject to any further survey or approval requirements once clearing commences. A proponent can then carry out re-clearing or routine maintenance for up to 10 years after the original authorised clearing. Where a significant residual impact to a protected plant is likely to occur, an offset may be required.

If the flora survey of the high risk area does not detect any EVNT plants in the clearing impact area, or the impacts on EVNT plants can be avoided (i.e. clearing will not take place within 100 m of the EVNT plants), a clearing permit is not required but an exempt clearing notification must be submitted to Department of Environment and Science (DES) within one year of the survey being undertaken, and at least one week prior to the clearing commencing.

The eastern end of the alignment is mapped as high risk for protected plants. This is due to records of *Dichanthium queenslandicum*. Although none were recorded in the June 2022 survey, and most grasses were flowering, a formal protected plant survey will be undertaken in areas of high-risk trigger mapping within 12 months of clearing (a requirement under Queensland legislative framework). Should the species be found, efforts will be made to avoid during clearing. If the species cannot be avoided, a suitable mitigation will be determined in consultation with DCCEEW/Department of Resources (DoR).

2.2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* (BS Act) provides a legislative framework to manage pest fauna and pest flora, diseases, and environmental contaminants, to address the impacts they have on the economy, environment, agriculture, tourism, and society. The Act prohibits or restricts the introduction and spread of declared plant and animal pests within Queensland. Weeds and pest animals pose threats to flora and fauna and agriculture uses within the Project area.

Field ecology surveys identified the presence of pest plants and animals within the Project area. The presence of weeds species in the Project area and their proposed control are addressed in this VMP.

2.2.5 Environmental Offsets Act 2014

In Queensland there is an offsets framework governed by a range of legislation, policies and guidelines to support a determination as to when environmental offsets are required, and how they are to be delivered. The Queensland Offsets Framework includes:

- *Environmental Offsets Act 2014* (Qld)
- Environmental Offsets Regulation 2014 (Qld) (EO Regulation)
- *Queensland Environmental Offsets Policy* (QEOP) (version 1.6)
- *Significant Residual Impact Guideline* – for prescribed activities under NC Act, EP Act and Marine Parks Act (DEHP 2014).

Under the Queensland Environmental Offsets Framework an environmental offset is required when a significant, residual impact occurs to an MSES. MSES are prescribed in Schedule 2 of the EO Regulation and include:

- endangered and vulnerable flora and fauna species under NC Act and their habitats
- special least concern fauna species under NC Act and their habitats
- endangered and of concern REs under VM Act
- essential habitat (mapped by DES)
- REs that intersect with wetlands and watercourses
- connectivity values
- wetlands of high ecological significance
- protected areas (including nature refuges)
- declared fish habitat areas and waterways providing for fish passage

- legally secured offset areas.

2.3 Survey guidelines

The timing and survey methods adopted for ecological surveys were guided by the applicable Queensland and Commonwealth survey guidelines. Vegetation community survey methods were consistent with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*, Version 5.1 (Neldner et al. 2020).

3 Existing environment and ecological values

3.1 Field survey activities

An initial walkover of the Project area was undertaken between 6–9 December 2021 by Sandra Walters and supported by Daniel Kelly. The walkover included general habitat assessments, incidental threatened flora, and fauna searches.

The second round of field surveying occurred between 7–12 March 2022, led by Sandra Walters and Andrew Jensen and supported by Daniel Kelly and Elliot Leach. The March survey represents a late wet season/autumn seasonal survey for the Brigalow Belt bioregion under the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre et al. 2018). This coincides with an active period for fauna including dispersal and migration of many species. It is also more likely to be moist from summer rainfalls, than during the spring to early summer period, and overlaps with grass reproduction and propagation, which is important for granivores.

Further surveying was completed between 28 June – 1 July 2022, led by Sandra Walters and supported by Elliot Leach. These surveys focussed on verification of regional ecosystems present, potential for threatened ecological communities (TEC) and species habitat mapping.

A final field survey was completed by a team of two EMM ecologists, led by Elliot Leach and supported by Rachel Scott between 21–24 November 2022 on Lot 11 and Lot 2, to undertake spotlighting for MNES species potentially present, particularly Koala, Greater Glider and Ornamental Snake.

A summary of the flora survey methods and results are outlined in the MNES Preliminary Documentation (EMM 2023), and key findings are detailed below.

3.2 Project area values

The Project area is in the Brigalow Belt North Bioregion and Northern Bowen Basin sub-region. Surface elevations across the Project area range from approximately 290 m Australian Height Datum (AHD) at the high-pressure pipeline entry to the NQGP to approximately 330 m AHD at Red Hill Bluff, 2 km west of the GCF. Generally, the terrain is flat open grazing country.

The Project area is divided by the Burdekin Basin and Fitzroy Basin. The western part of the alignment is in the Burdekin Basin catchment and generally drains into the Suttor River and heads north. The eastern part of the alignment is in the Fitzroy Basin catchment and drains into the Isaac River.

The buried high-pressure pipeline alignment crosses Goonyella Creek which is a stream order 1 watercourse. Within the Project area, Goonyella Creek is an ephemeral drainage feature with no discernible banks.

3.3 Regulated vegetation communities

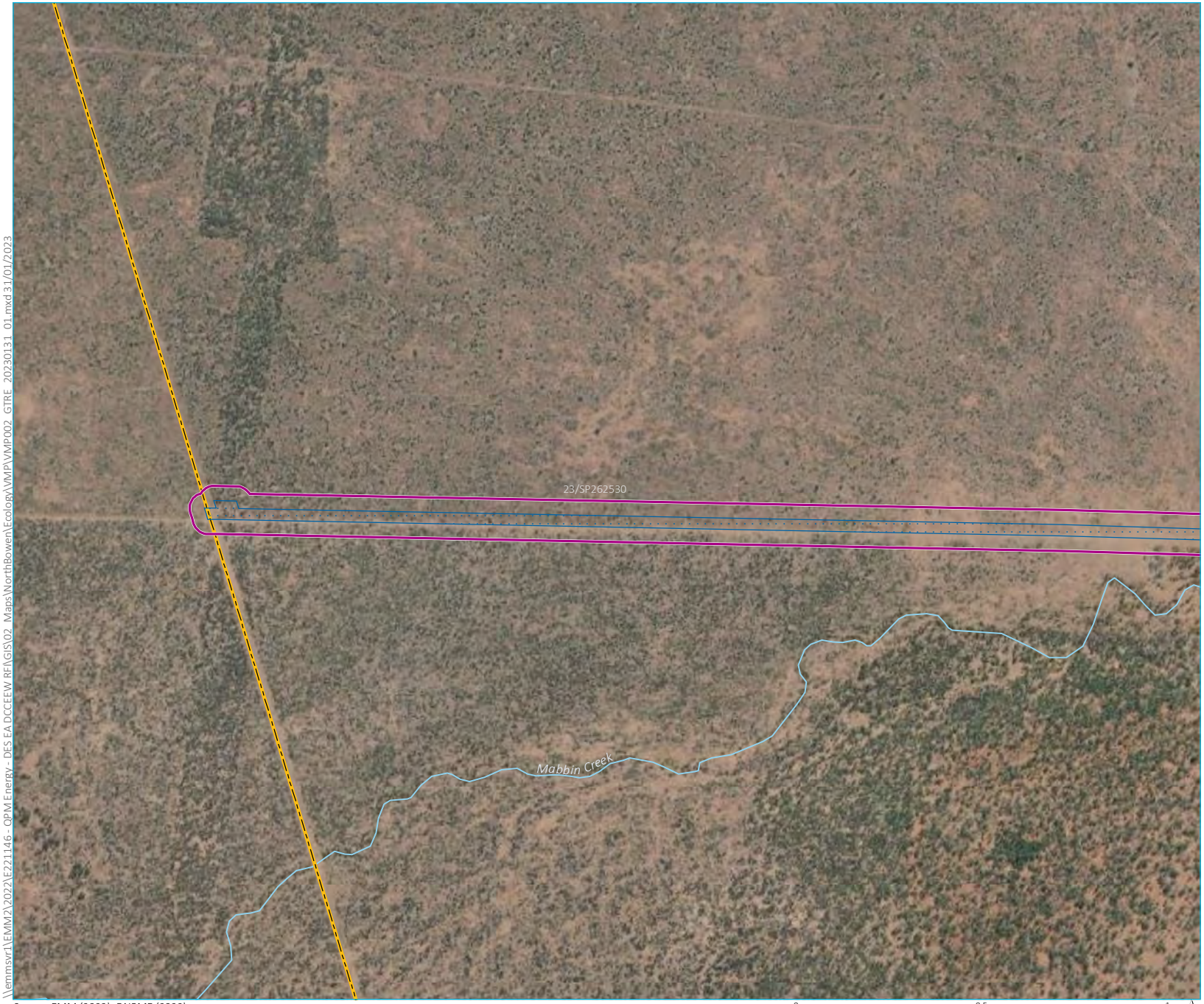
3.3.1 Regional Ecosystems

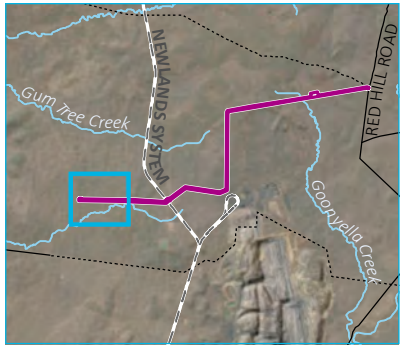
A summary of the ground-truthed REs, their description and status are provided below in Table 3.1. Figure 3.2 locates the ground-truthed REs within the Project area.

Table 3.1 Ground-truth REs within Project area

RE code	Description	VM Class	Remnant (ha)	HVR (ha)
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	4.74	0
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces	Endangered	3.04	0.37
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks	Least Concern	0.26	0
Non-remnant			56.64	

Note: HVR = High value growth





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

Ground-truthed regional ecosystems
Map 1 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.1

EMM
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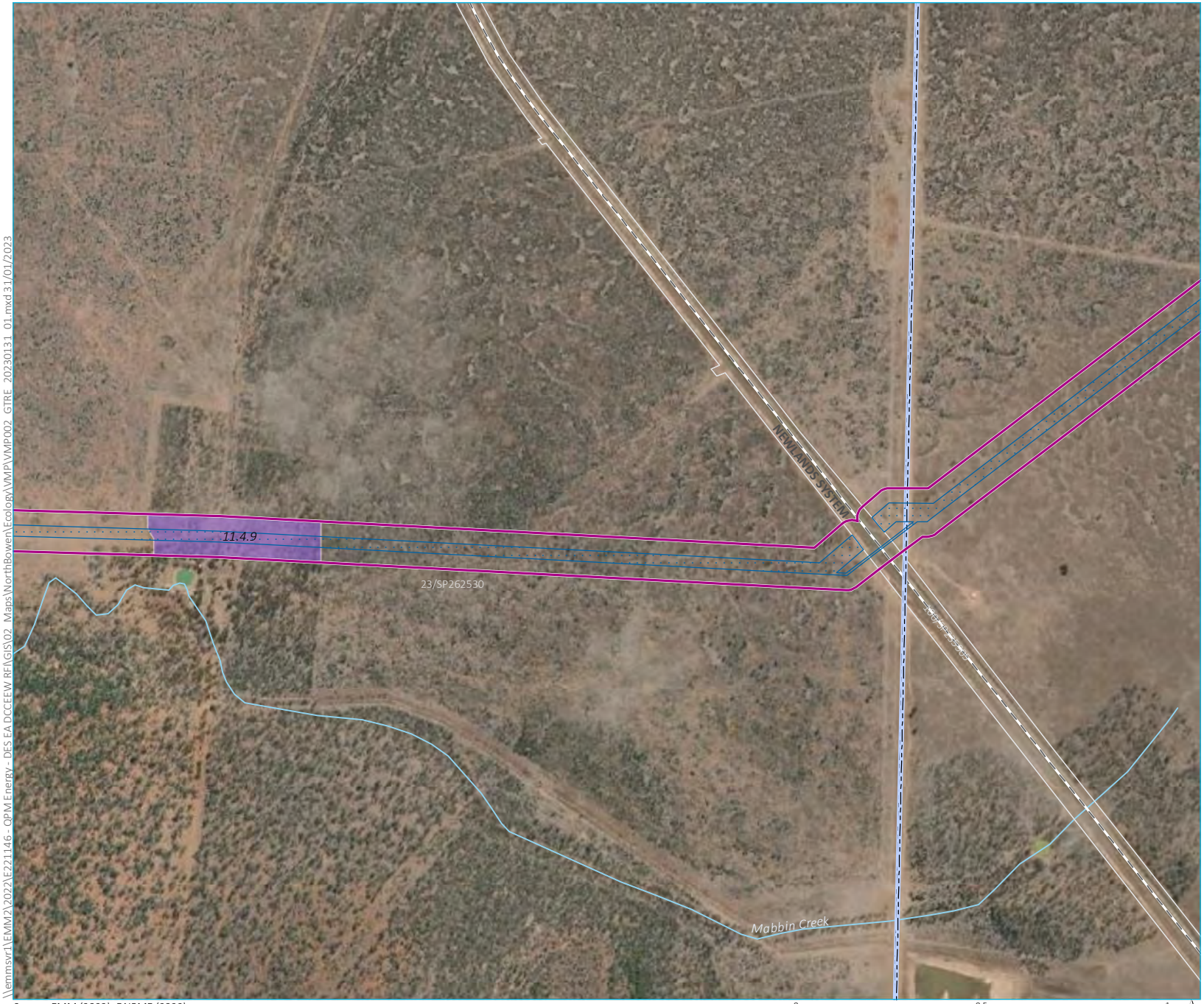

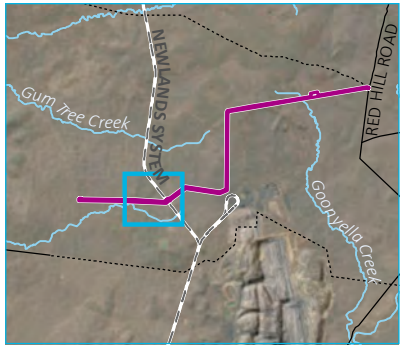

KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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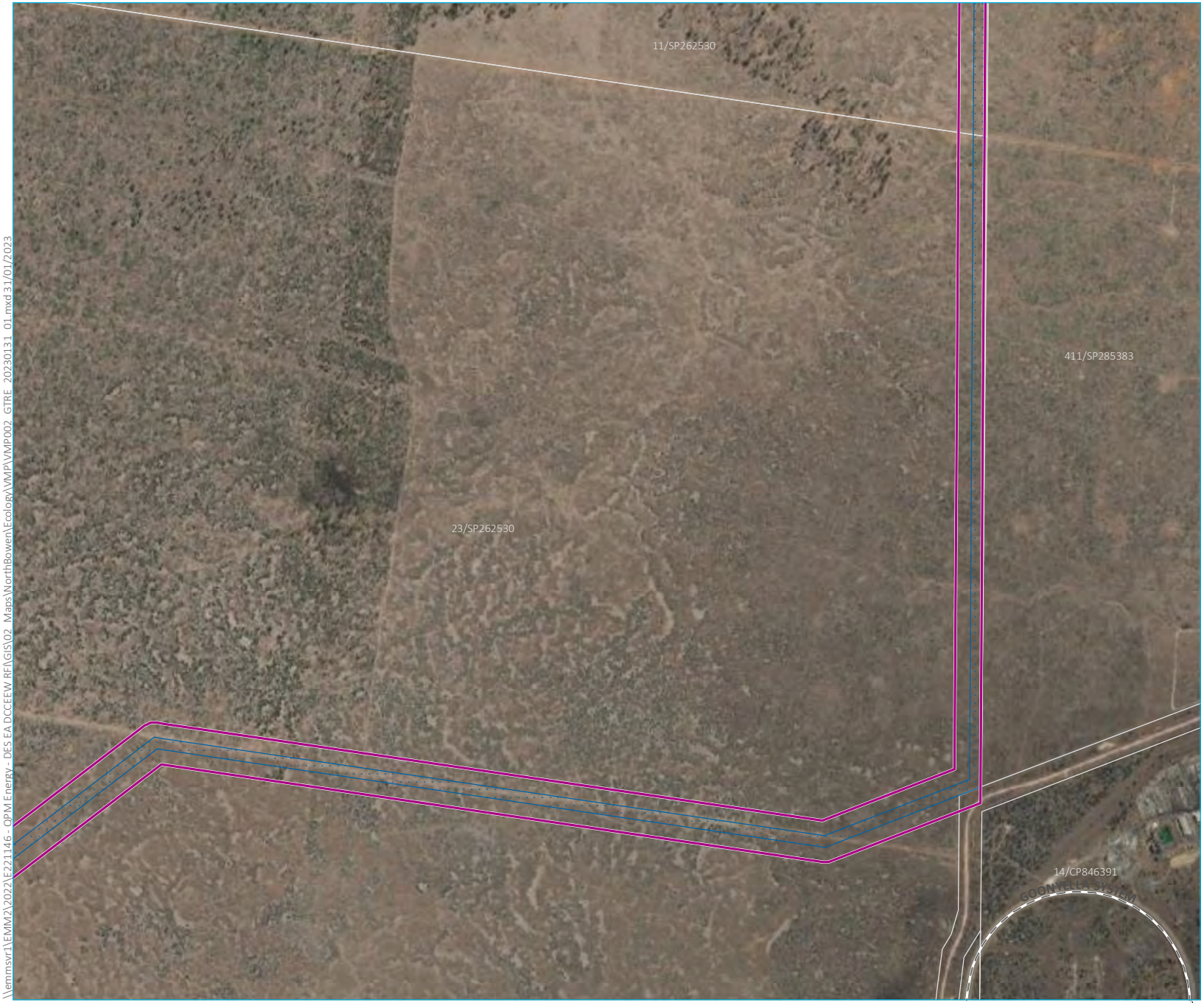
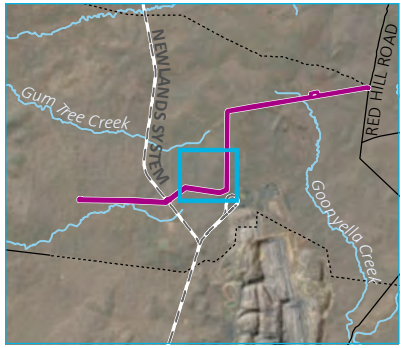
Ground-truthed regional ecosystems
Map 2 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.1

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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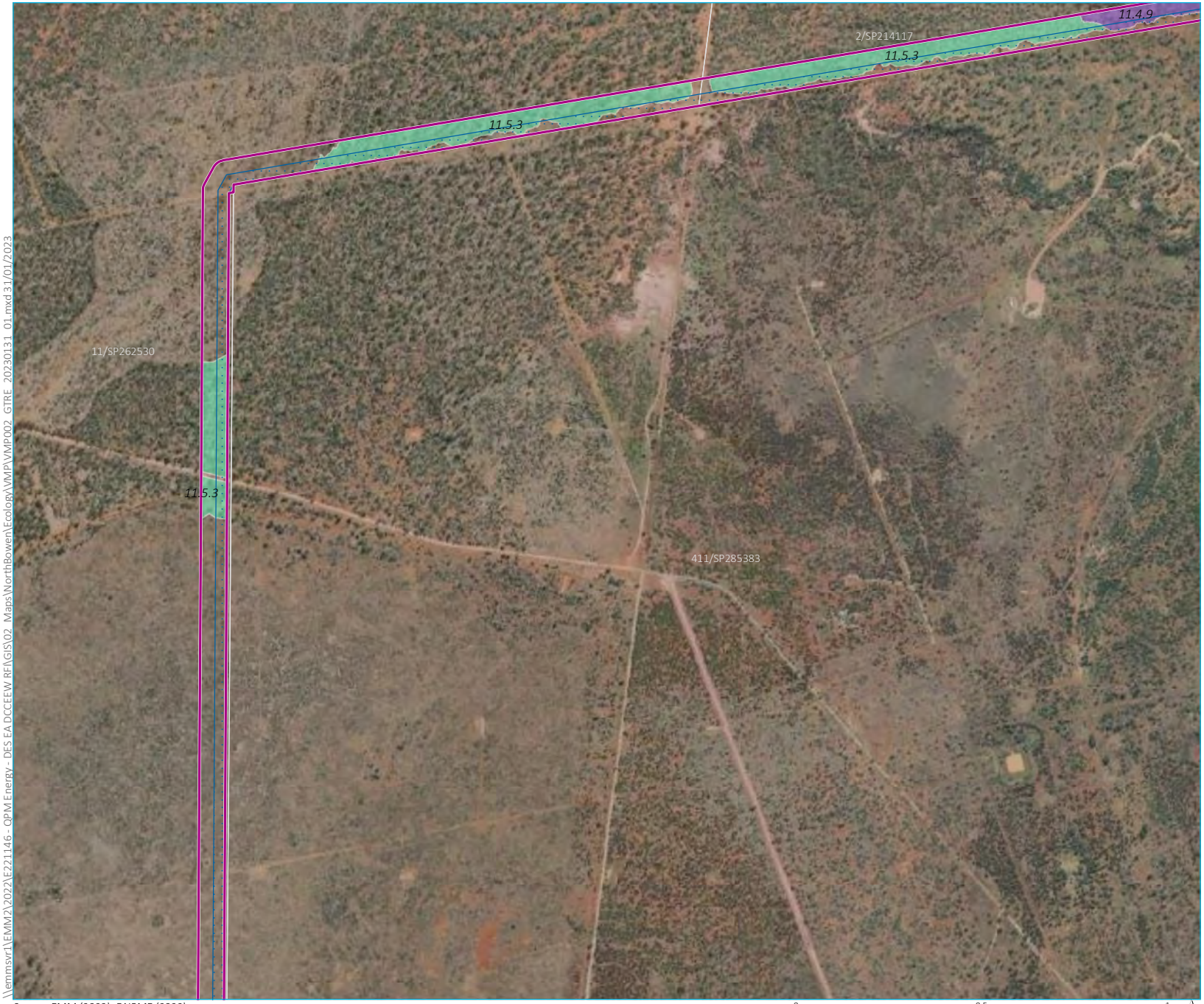
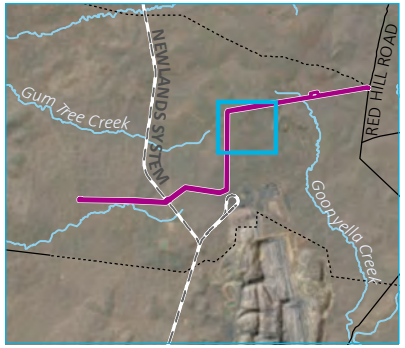
Ground-truthed regional ecosystems
Map 3 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.1

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered
- Remnant - least concern

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

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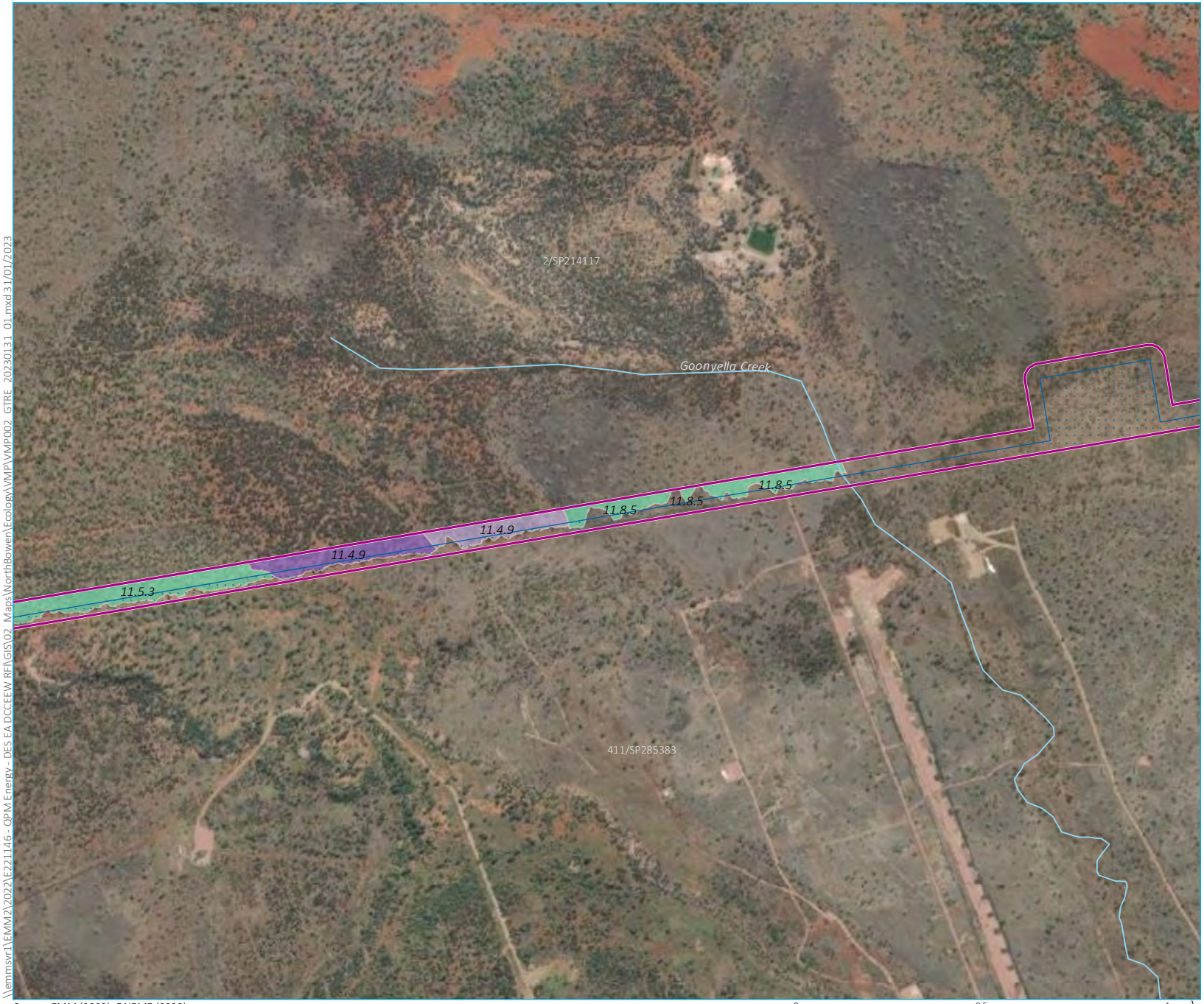
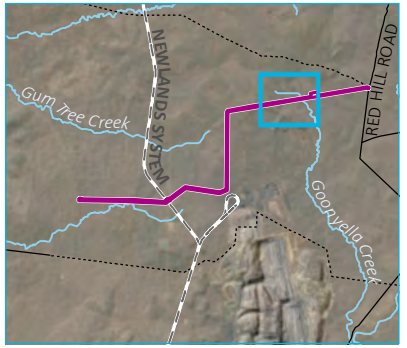
Ground-truthed regional ecosystems
Map 4 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.1

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered
- High value regrowth - endangered
- Remnant - least concern

Ground-truthed regional ecosystems
Map 5 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.1

Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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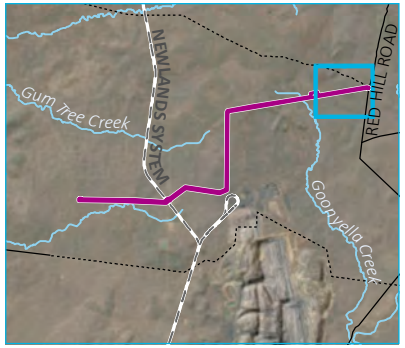

KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered
- High value regrowth - endangered

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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Ground-truthed regional ecosystems
Map 6 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.1

EMM
creating opportunities

3.3.2 Threatened Ecological Communities

Field surveys confirmed that the Poplar Box and Semi-evergreen vine thicket (SEVT) TECs are not present on Lot 23 or Lot 411.

REs that are analogous with the Brigalow, SEVT and Grassland TECs are mapped within the Project area on Lot 23 (Brigalow TEC only), Lot 11 and Lot 2. However, ground-truthing has confirmed that SEVT and Grassland TECs are not present. Small patches of vegetation communities analogous with Brigalow TEC are present on Lot 411 and Lot 2.

Brigalow TEC areas are discussed in more detail in the following section.

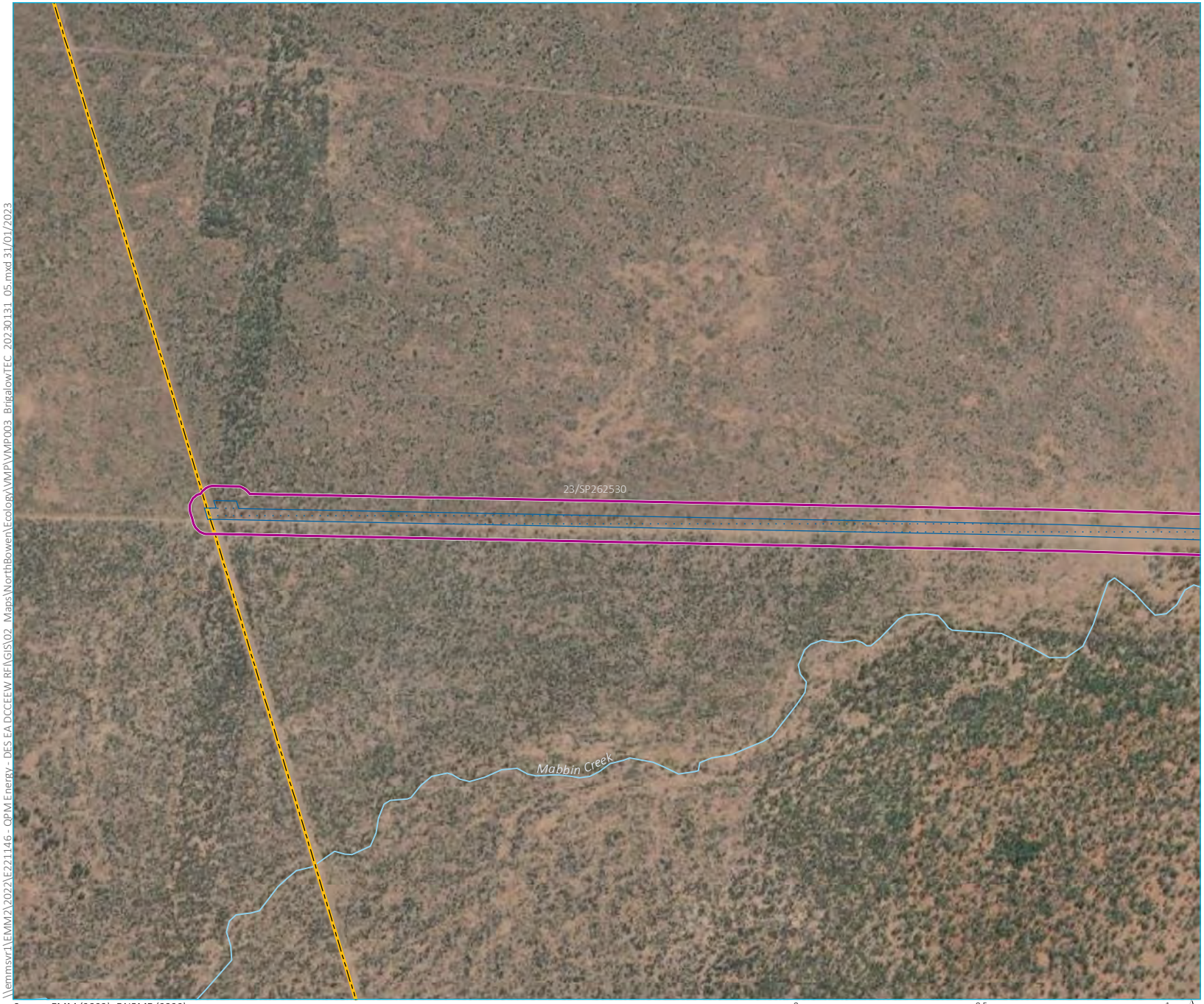
i Brigalow TEC

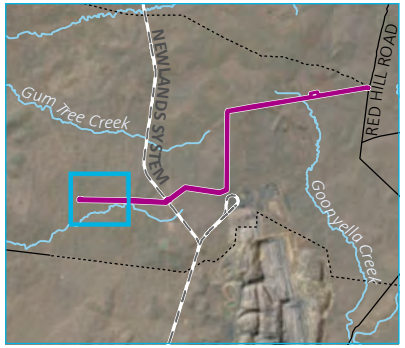
Seven mapped polygons of remnant or regrowth REs that are included in the Brigalow TEC description (RE 11.4.8 and 11.4.9), are mapped within the Project area. Five of these occur on Lot 411, which are now excluded from the Project area. One patch of HVR RE 11.4.9 occurs on the original high-pressure pipeline on Lot 23, which has also now been superseded. One patch of remnant RE 11.4.8/11.4.9 occurs on Lot 23, within the current high-pressure pipeline alignment. On Lot 2, several patches of Brigalow community are present that are not mapped correctly in the RE mapping.

Regrowth vegetation qualifies as the Brigalow TEC, provided it meets the condition thresholds listed above. One of the five patches on Lot 411 qualify as the Brigalow TEC, as the cover of Buffel Grass is less than 50%; within the extent of the Project (buffer only, not the high-pressure pipeline), the other four patches are too degraded through Buffel Grass invasion to meet the TEC definition. However, this area has now been superseded by the revised high pressure pipeline alignment and will not be impacted.

The Brigalow patch on Lot 23 in the superseded alignment meets the definition of the Brigalow TEC, as Brigalow is dominant in the canopy, the vegetation is consistent with regrowth of an analogous RE (11.4.9), the patch is approximately 2.36 ha in size, and exotic perennial cover is around 35%. Further, the historical aerial imagery indicates that the patch has not been cleared since at least 2000 (possibly earlier), so also meets the disturbance criterion (not comprehensively cleared for at least 15 years). However, the Brigalow patch on Lot 23 through which the revised alignment passes is heavily invaded by Buffel Grass and other exotic species, with an average cover assessed over the entire patch (approximately 5 ha) of between 60–100%. Therefore, this patch does not need the condition threshold to qualify as the Brigalow TEC.

Ground-truthing of vegetation identified errors in the certified Regional Ecosystem mapping on Lot 2. Whilst no Brigalow REs are mapped, remnant and high value regrowth of RE 11.4.9/11.4.8, which is analogous to the Brigalow TEC is present (refer Figure 3.2).





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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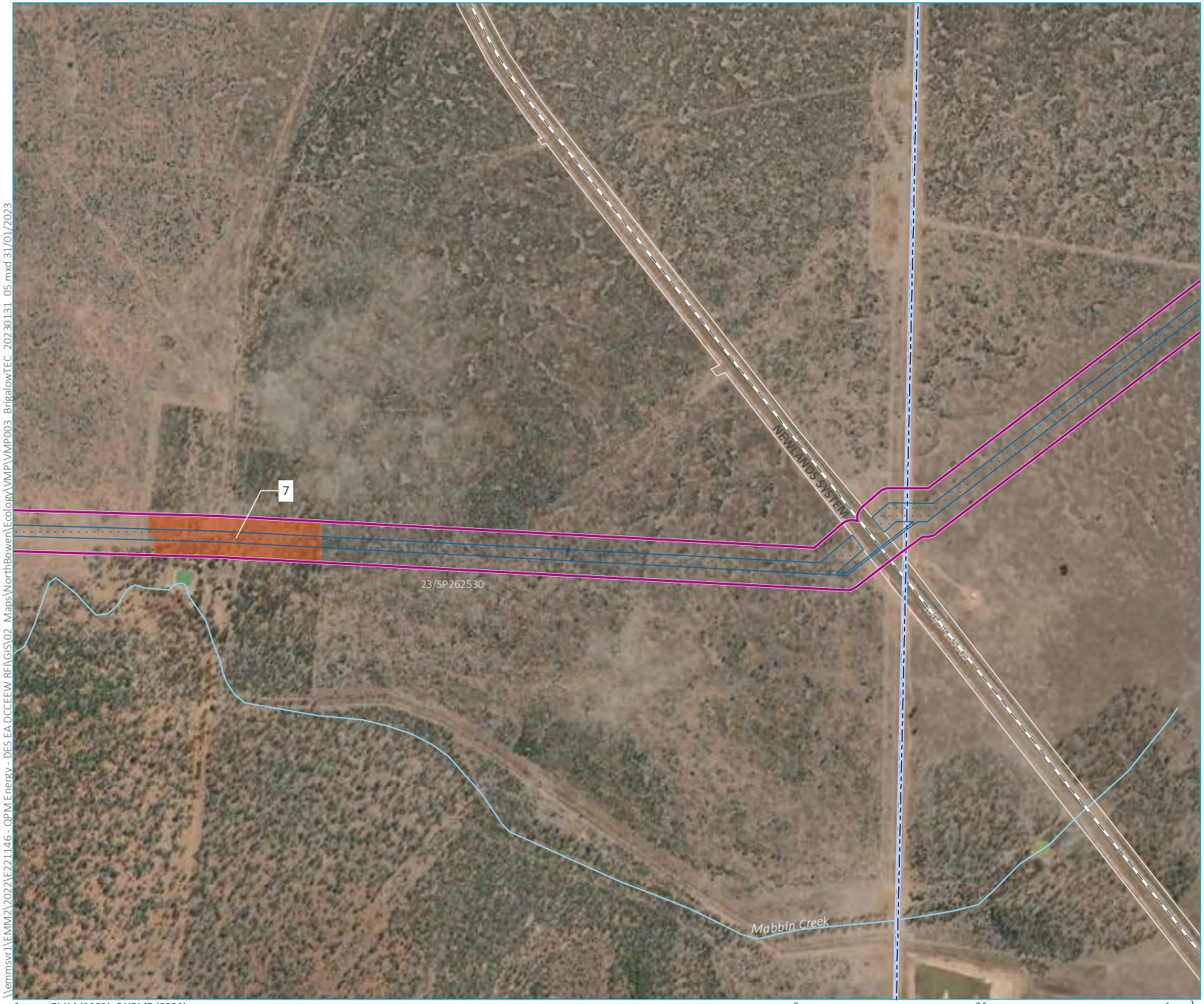
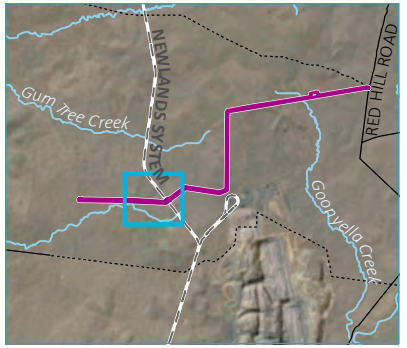
Brigalow Threatened Ecological Community within the project area Map 1 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.2

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Brigalow vegetation

Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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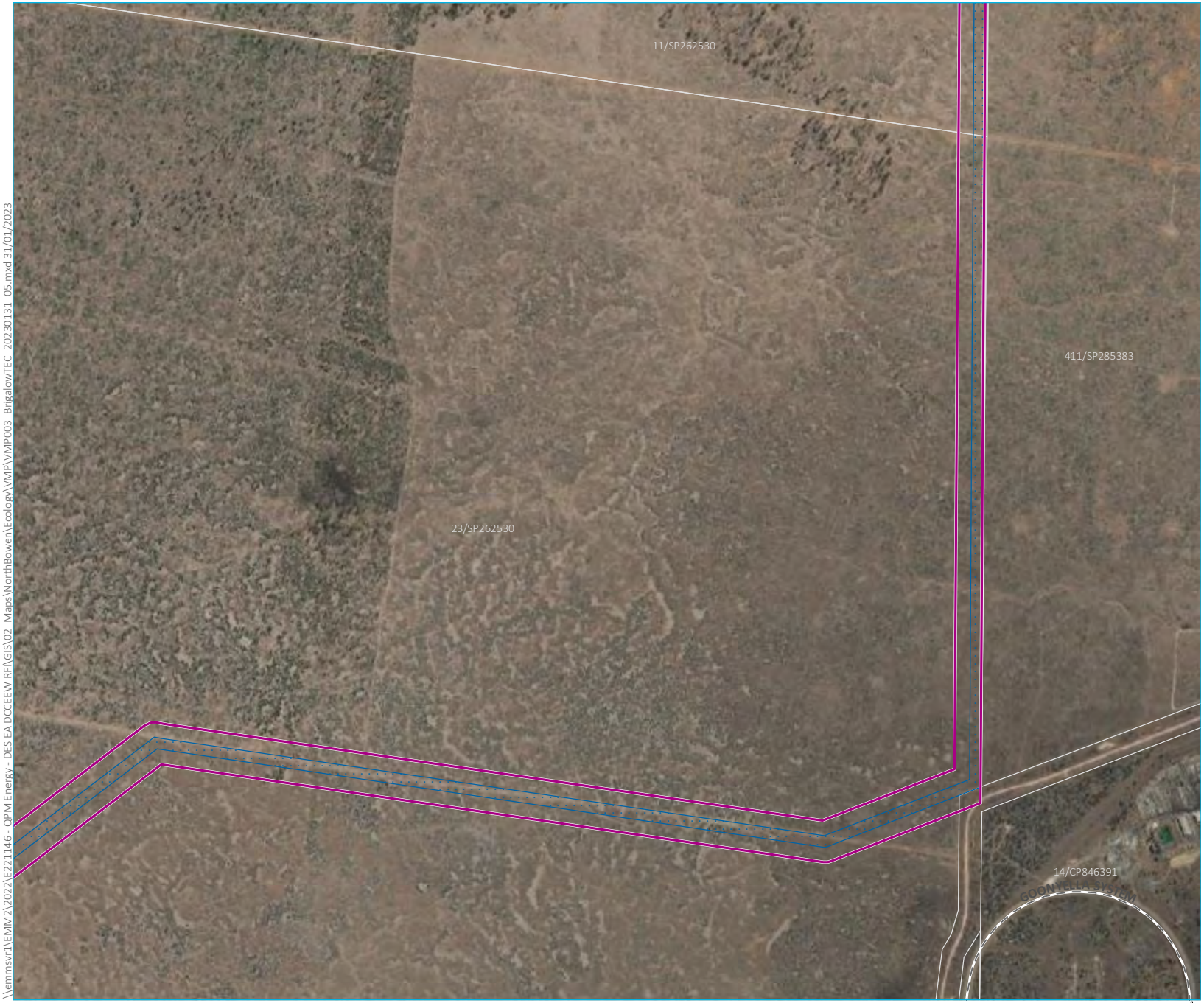
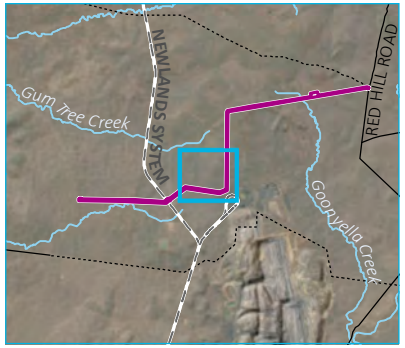
Brigalow Threatened Ecological Community within the project area Map 2 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.2

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

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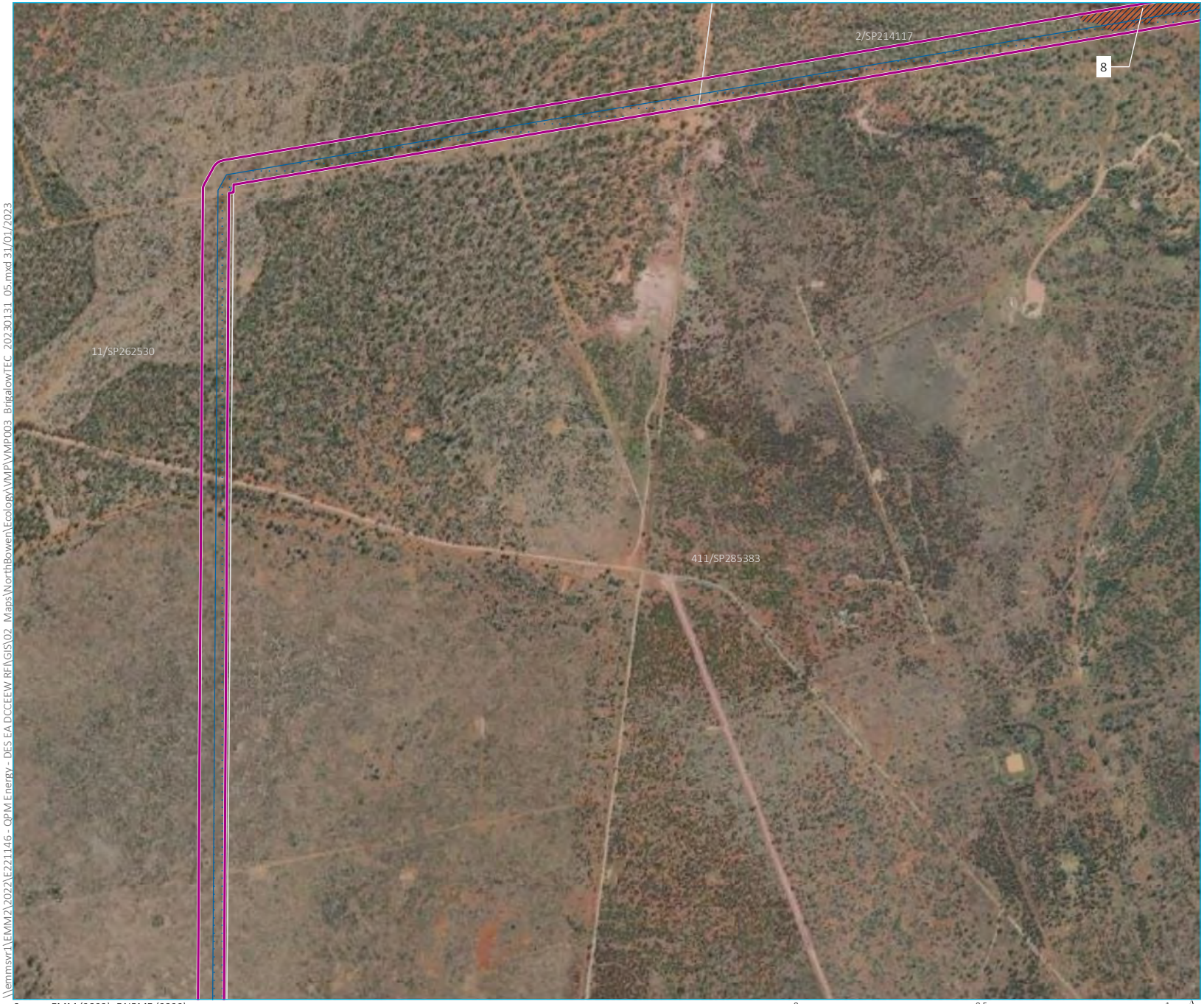
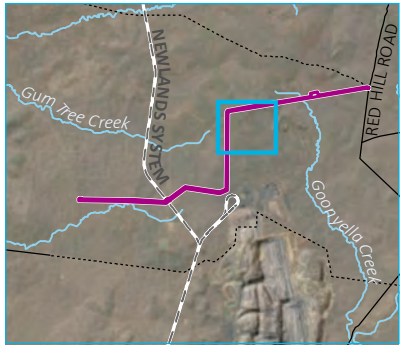
Brigalow Threatened Ecological Community within the project area
Map 3 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.2

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary
- Brigalow TEC
- Brigalow vegetation

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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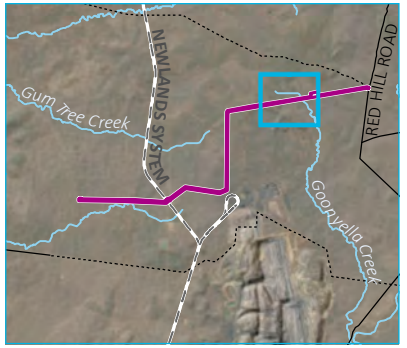
Brigalow Threatened Ecological Community within the project area Map 4 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.2

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Brigalow TEC
- Brigalow vegetation

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02_Maps\NorthBowen\Ecology\VMP\VMP003_BrigalowTEC_20230131_05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

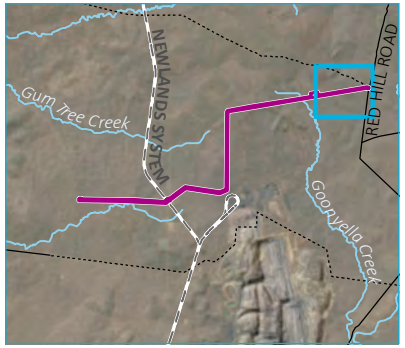
GDA 1994 MGA Zone 55

N

Brigalow Threatened Ecological Community within the project area
Map 5 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.2

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Brigalow vegetation

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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Brigalow Threatened Ecological Community within the project area Map 6 of 6

QPM Energy Project
Vegetation Management Plan
Figure 3.2

EMM creating opportunities

3.4 Flora

3.4.1 Threatened flora species

Threatened flora species were searched for across the Project area. No threatened species were recorded during ecological surveys. *Eucalyptus raveretiana* (Black Ironbox), which is a tree, occurs in riparian (river) habitats, which is not present in the Project area, and this species was confirmed to be absent. Likewise, *Samadera bidwillii* (Quassia), a shrub, grows in dry rainforest and vine thicket. This habitat is also absent, and Quassia was not present in the Project area.

Three species of threatened grass, *Dichanthium queenslandicum* (King Bluegrass), *Dichanthium setosum* (bluegrass) and *Digitaria porrecta* (Finger Panic Grass) were identified in database searches or the PMST as potentially occurring within the Project area. The December 2021 surveys of Lot 411 confirmed that the majority of the grassed extents within Lot 411 are dominated by introduced grasses and forbs. Several grasses were sampled and lodged with the Queensland Herbarium from a patch of grassland immediately west of Goonyella Creek. These samples were confirmed as not belonging to these threatened species.

Targeted searches for these grasses were completed during the post-wet season March 2022 survey on Lot 411 and Lot 23. On Lot 411, meanders were completed through the natural grassland patches, as well as the mapped grassland RE (11.8.11/11.8.5) in close proximity. No threatened species were located, and the majority of grassland patches were in degraded condition, with Buffel Grass in abundance. Significant rain had fallen prior to the March 2022 survey, and grasses were in flower at the time of survey, including species of *Dichanthium* and *Digitaria* genera.

During the June/July 2022 survey, on Lot 23, Lot 11 and Lot 2, meanders for the target threatened grasses were completed whilst undertaking quaternary assessments, as well as in transit through the high-pressure pipeline alignment between sites. On Lot 11 and Lot 2, the high-pressure pipeline alignment was searched thoroughly on foot by two ecologists for the threatened grasses wherever suitable habitat was present (i.e. heavy clay soils and/or stony red-brown loam). Due to preceding rains, the majority of grasses were flowering at the time, including *Dichanthium* and *Digitaria* species, so there was a high level of confidence in the detectability of these species. A total of 43 quaternary sites were completed within suitable habitat on Dabin Station and Denham Park, and no threatened grasses were recorded. Grazing, clearing and weed invasion are known threats to all three species (DCCEEW, 2023a; DCCEEW, 2023b; DoE, 2008; DoE, 2013a), and all are significant ecological drivers within the Project area. As such, it is considered unlikely that any occur within the Project area.

3.4.2 Weeds and pests

Due to the highly disturbed nature of the Project area a number of weed species were recorded. Open (non-remnant) areas were dominated by groundcover weeds, primarily Parthenium (Parthenium hysterophorus) and Buffel Grass (Cenchrus ciliaris). Parthenium is a category 3 restricted invasive plant under the Biosecurity Act, and was recorded on all subject Lots within the Project area. It is particularly dense in the black soil sections of Lot 23 (Denham Park Station) and Lot 2 (Dabin Station).

It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). Parthenium is also a Weed of National Significance (WoNS) at Commonwealth level.

Additionally, Harrisia Cactus (*Harrisia martini/Harrisia toruosa*) and Prickly Pear (*Opuntia sp*) were recorded at a number of locations in the Project area.

Harrisia Cactus and Prickly Pear are also category 3 restricted invasive plants under the *Biosecurity Act 2014*, and was recorded at widespread locations throughout the Project area albeit not in high densities. Prickly Pear is also a WoNS at Commonwealth level.

Additionally, although not recorded in the Project area, Rat's tail grasses (particularly Giant Rat's Tail Grass – *Sporobolus pyramidalis*/*S. natalensis* are identified as a high risk species for invasion of the Project area which can reduce pasture productivity and cause significant degradation of natural areas. Other high risk species for establishment include Fireweed (*Senecio madagascarensis*).

Weed and pest management is addressed separately (refer Appendix L of the MNES Preliminary Documentation report).

4 Potential impacts

QPM Energy will avoid impacts to native vegetation communities to the greatest extent practicable. The mitigation hierarchy of avoiding, minimising and mitigating any potential impacts on native vegetation will continue to be followed throughout the design, construction and operation of the Project. Where impacts cannot be avoided, mitigation and management measures will be implemented to reduce residual impacts to the lowest extent practicable. As much of the site has previously been cleared for agricultural and mining activities, QPM Energy will be able to site infrastructure in a way that will minimise impacts.

The following sections discuss the Project's potential impacts on vegetation communities and flora.

4.1 Vegetation and habitat clearance

The Project area supports areas of remnant vegetation and regrowth as well as extensive non-remnant areas which are dominated by gilgai.

The site layout has evolved to minimise vegetation clearing and impacts on MNES habitats. This has included:

- The location of the compressor facility is in an area of non-remnant vegetation, with shrubby regrowth and weedy understorey. This area is not suitable habitat for any of the target threatened species.
- The high-pressure pipeline alignment will follow existing clearings (e.g. fence lines, pulled and cleared pasture, firebreaks, access tracks) where practicable to minimise disturbance on the surrounding environment.
- QPM Energy sought to use the existing Peabody access track for access to the compression facility although were denied. The chosen access route was deemed as the most viable route due to minimised distance and impact to remnant vegetation.

The total estimated area of vegetation clearing is 8.04 ha od remnant vegetation, 0.37 ha of regrowth vegetation and 56.64 ha of non-remnant areas as outlined in Table 3.1.

4.2 Fragmentation

Terrestrial habitat connectivity may be reduced as a result of a Project due to clearing which has potential to reduce fauna movement between areas of retained remnant or regrowth vegetation. Such habitat fragmentation is more prominent where clearing widths are larger, such as over 100 m (construction corridor is 30 m wide and largely co-located with existing fencelines), and intersect intact areas of vegetation. Clearing linear widths through habitats also has the potential to increase edge effects (additional light entering forest, weed encroachment, feral animal abundance may increase and increased risk of bushfire) which has a negative impact on ecological functions for those areas.

Some species are more prone to this fragmentation of habitat. Other species such as Squatter Pigeon are not likely to be impacted by these cleared areas as they are known to disperse quite readily across non-remnant areas, and have commonly been found on existing dirt access roads.

Post-construction, the easement will shrink to a 15 m operating width (i.e. 30 ha) which comprises the 11 m to the high-pressure pipeline centreline. This section typically includes a fence and farm track/firebreak running each side of a fenceline plus 4 m to the other side of the pipeline to allow pipeline remediation, if required. This approach will keep occasional inspection access to an existing farm track which will enable the remaining area to rehabilitate.

Terrestrial habitat connectivity in the vicinity of the GCF may be disturbed as a result of the Project by obstructing movement of fauna across the 200 m x 300 m fenced area, although this area contains non-remnant vegetation.

However, much of the proposed disturbance has been focused along existing cleared fence lines in these areas and is considered very unlikely to pose an ongoing issue to habitat connectivity following the construction disturbance and subsequent revegetation and maintenance of the corridor. Any impacts to remnant vegetation that are unavoidable have sought to clear areas adjacent to existing clearance, to avoid further fragmentation.

There is one waterway passing through the alignment – Goonyella Creek. The crossing of this minor watercourse which is perpendicular to the pipeline corridor is unlikely to be impacted in terms of fragmentation.

Large areas of habitat surrounding the alignment will not be impacted and will be retained, including extensive areas of gilgai. This will ensure the EVNT species likely to utilise the Project area still have large areas that be utilised as corridors, including to habitats outside the Project area.

Weed management, pest animal management and bushfire management will be implemented to minimise environmental impacts from the Project on native species and habitats.

4.3 Erosion and sedimentation and changes in water quality and hydrology

The main construction activities that could impact on water quality are excavations and earthmoving for construction of the pipeline as well as ancillary infrastructure. This may lead to erosion and sedimentation, reduction in water quality and changes to water flows.

During construction activities, sediment may be mobilised and transported by surface water during rainfall events, ultimately discharging into watercourses and drainage lines and potentially reducing water quality in downstream aquatic habitats. Increased suspended sediments can reduce light penetration into the water column, reducing photosynthesis of aquatic macrophytes, and decreasing dissolved oxygen levels.

Changes in the hydrology of the Project area may occur through alteration of surface flows and stormwater runoff, including obstruction of flow. This can result in scouring or waterlogging occurring in some areas.

The accidental release of pollutants (including spills from construction vehicles and plant, leaks and other uncontrolled releases) into the surrounding environment and waterways has the potential to degrade aquatic habitat quality in the Project area and impact vegetation communities and terrestrial fauna utilising these areas. This includes direct toxic impacts on fauna from ingestion or inhalation. Without mitigation, contaminants may enter waterways including oily wastewater (from heavy equipment cleaning), contaminated runoff from chemical or fuel storage areas and general washdown water. Impacts to groundwater are not anticipated from the Project.

There will be no extraction of groundwater therefore there are no pathways through which the quantity of groundwater can be impacted (earthworks will be at or near ground surface level). Release of pollutants or contaminated runoff from the site have the potential to impact on groundwater quality. However, Project infrastructure will be designed and constructed to ensure that water quality objectives are met, and pathways to impact surface and groundwater quality are minimised.

The proposed water management approach is currently being designed with consideration of several key water management objectives, including:

- progressive rehabilitation of disturbance areas anticipated to minimise the potential for erosion and sediment incidents occurring
- the construction ROW will be reduced to an operating easement, with much of the ROW being rehabilitated (exception of a maintenance road)
- the maintenance road surface material will be fit for purpose to avoid scouring and reduce the potential for increased sediment loads in surface water run-off
- an oily water treatment unit will be installed and utilised during the operational phase of the project to separate oily water

- separated oily water will be trucked off-site and processed at an existing registered water treatment facility and the clean water returned to the relevant mine site to meet their regulatory requirements for water management
- the depth of the high-pressure pipeline has been assessed and is not anticipated to impact on groundwater resources.

A detailed Environmental Management Plan (EMP) will be prepared that identifies erosion and sediment control measures to be implemented during clearing and earthworks. Strict controls will be put in place to ensure sediment does not runoff into watercourses, and erosion of steep batters does not occur.

4.4 Bushfire

Fire is a natural part of the Australian landscape, and most vegetation communities are adapted to periodic fires. However, changes in the natural fire regime may result in changes in the species composition and/or structure of the vegetation. The increased presence of construction vehicles and personnel in the Project area may increase fire risk through use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.

An EMP will be prepared that identifies how fire will be avoided and managed during all phases of the Project. It will be important that any fires started from site activities are put out quickly and no unplanned bushfires occur. Fuel loads will need to be managed across the Project area, and bushfire buffers to infrastructure maintained.

4.5 Air quality and dust emissions

Increased dust from vegetation clearing, soil stripping and vehicle movements during construction has the potential to temporarily and locally impact flora and fauna values in the vicinity of the Project footprint. Excess generation of dust and subsequent deposition on leaves can impair plant photosynthesis and productivity (also resulting in reduced habitat quality for fauna), alter soil properties impacting on plan species assemblages and reduce water quality in aquatic habitats.

Dust is expected to potentially be an issue during vegetation clearing and construction. Dust levels will be monitored and when needed dust suppression implemented such as wetting down dirt roads or reducing vehicle speeds. These measures will be further defined within the EMP.

4.6 Pests and Weeds

Project activities have the potential to increase the abundance of pest flora in the Project area and facilitate dispersal of species to previously unimpacted areas. For linear projects such as pipelines across multiple properties, varying level of weed infestation can be a significant issue.

Uncontrolled movement of vehicles, equipment and personnel throughout the Project area is the key vector of transmission, in particular vehicles and equipment sourced from regions beyond the Project area which may introduce new species. Many weed species thrive on ground disturbance and will rapidly colonise disturbed areas in advance of native species recolonisation.

Pest and weeds may pose a significant threat to flora and fauna values adjacent to the Project area and the productive capacity of adjacent agricultural and grazing lands. Much of the grazing lands already contains a proportion of introduced grass species designed to improve the grazing capacity of the land. Species such as Buffel Grass are a significant component. Weeds such as Prickly Pear (occasional plants) and Parthenium were encountered during the surveys.

Increased pest flora abundance has adverse impacts on native vegetation and biodiversity, as well as potential negative economic effects on local land uses such as grazing activities.

Project related activities may also increase pest fauna abundance in the Project area. This can lead to increased competition with, and predation of native fauna. In addition, habitat degradation may occur through vegetation trampling. Creation of new access points into areas of intact vegetation may create pathways for feral fauna species to disperse. In addition, the creation of artificial water sources may increase the capacity of the area to support feral species such as Cane Toads. Uncontained waste sources may also attract feral fauna such as Wild Dog.

5 Impact avoidance, mitigation and management

The approach used to assess Project impacts utilises proven mitigation measures that have been successfully implemented, or are standard practice. Mitigation measures which have not been proven, or are not known to be successful, have not been considered in the management actions outlined below. Without evidence of the effectiveness of mitigation, the precautionary principle is applied. Avoidance and minimisation through design has been prioritised as the most effective measure. In addition to the VMP the following management plans have been prepared for the Project:

- Fauna Management Plan (FMP)
- Draft Environmental Management Plan
- Draft Rehabilitation Strategy
- Draft Construction Weed and Pest Management Plan.

QPM Energy and associated contractors will be responsible for implementing all avoidance, mitigation and management measures, except where landowner agreements specify otherwise.

Management and mitigation measures have been developed to align with the S.M.A.R.T principle, to ensure that measures are:

- Specific – prescriptive, with no uncertainty or ambiguity around their purpose or implementation.
- Measurable – the status (i.e. success or failure) and outcomes/results can be measured.
- Achievable – through the chosen method of implementation, by the responsible personnel and within the specified timeframe.
- Relevant – to the action/impact being controlled and to the protected matter.
- Time bound – measures were given specific and achievable timeframes for implementation in relation to specific development activities or stages.

Management measures and performance outcomes are detailed in the management plans prepared and included as appendices to this report.

5.1 Avoidance and minimisation

During early stages of Project design, and following ecological surveys of the Project area, QPM Energy has sought to avoid and minimise ecological constraints wherever practicable. The Project area is heavily disturbed by current and past land use with vegetation being predominantly non remnant with minor areas of remnant vegetation. The following general measures will be implemented to avoid and minimise environmental impacts to the greatest practical extent:

- Vegetation clearing will be limited to those areas required for earthworks and construction of the Project. Those areas which are not required for the ongoing operation and maintenance of the Project will be rehabilitated as part of the construction process. Rehabilitation will be detailed in a VMP to be prepared prior to commissioning of the Project.

- The approved disturbance area will be clearly demarcated prior to clearing to avoid unnecessary clearing of vegetation and to ensure personnel and vehicles stay within the approved footprint. Measures to ensure clearing limits are adhered to will be documented in the Construction EMP and addressed in site inductions.
- Clearing limits will be clearly demarcated on site, including through use of temporary fencing (e.g. flagging tape to mark out areas or plastic mesh fencing installed with star pickets) to avoid unintentional access to retained sensitive environmental areas.
- Large hollow bearing trees should be clearly marked for avoidance during construction if practicable.
- Sequential clearing of remnant vegetation will occur to minimise impacts on native fauna, particularly arboreal fauna which may be using tree hollows.
- Access points have been identified and are limited to approved access roads and tracks.

5.2 Vegetation and habitat clearance

The following measures will be implemented to mitigate and manage impacts as much as practicable during vegetation clearing:

- Prior to any clearing activities, pre-clearance surveys will be undertaken by a suitably qualified ecologist to:
  - Further identify MNES and other native fauna species habitats and clearly demarcate the habitats being retained to ensure no direct or indirect impacts occur during clearing and construction.
  - Searches for threatened grasses in suitable habitat.
  - Identify and mark hollow-bearing trees to ensure they are managed by the fauna spotter catcher during clearing phase.
  - Identify and mark any other active breeding places such as nests, burrows etc to ensure they are managed by the fauna spotter catcher during clearing phase.
  - Identify suitable release sites should any fauna species need to be captured and released during clearing phase.
  - Identify presence of weed species and identify if any require treatment prior to clearing.
- Sequential clearing will occur in areas where remnant vegetation is to be cleared. Key steps as part of sequential clearing are summarised below and will be formalised in a protocol as part of the Species Management Program to be prepared under the NC Act:
  - The first phase will consist of removing understorey vegetation and smaller juvenile trees only. Juvenile trees are under 4 m in height or trunk circumference of less than 31.5 cm at 1.3 m above the ground. No hollow-bearing trees will be cleared in Phase 1.

- After 48 hours the second phase can commence which is to clear the remaining larger trees, including those with hollows. Where practicable hollow bearing trees are to be “soft felled” to minimise the risk to hollow dwelling fauna. They will then be inspected by the fauna spotter-catcher post-felling to ensure no wildlife remain in the hollow. Where practicable fauna will be caught, and released into suitable recipient sites once clearing has stopped. If roosting bats are located they are to be “roosted” during the day in a safe, cool, dark space and released at night in areas of habitat to be retained.

- Dispersal corridors will be left in place that link vegetation with clearing areas to adjacent areas of retained habitat, and are to be maintained for a further 24 hours, to facilitate overnight dispersal. Such corridors will act as ‘stepping stones’ to allow any Koala present to depart to retained vegetation.

- It is important the clearing is done in such a way that arboreal fauna are given the opportunity to disperse from the area once clearing has commenced under their own volition.

- Fell trees away from retained areas of vegetation where practicable. Where trees unavoidably fall into retained areas, leave in-situ to mimic natural tree fall and provide habitat for ground-dwelling fauna.

- The eastern end of the new alignment is mapped as high risk for protected plants. This is due to records of *Dichanthium queenslandicum*. Although none were recorded in the June 2022 survey, and most grasses were flowering, a formal protected plant survey needs to be undertaken in areas of high-risk trigger mapping within 12 months of clearing (a requirement under Queensland legislative framework).

5.2.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Fauna spotter catchers will monitor vegetation clearing occurring and ensure that sequential clearing is occurring and clearing limits are being adhered to. Corrective actions include:

  - Replace any fencing or flagging tape that is in poor condition.

  - Where clearing extends outside the approved disturbance limits, a record must be taken of the incident and an investigation will occur.

  - Revegetation of additional cleared areas will be discussed and where required undertaken.

5.3 Fragmentation

The following measures will be implemented to mitigate and manage impacts of fragmentation as much as practicable during the construction and operational phases:

- Undertake staged clearing of native vegetation, and retain habitat trees where practicable, to minimise impacts to native fauna species.

- Implement weed and pest control across the Project area to reduce degradation of habitats and edge effects as a result of the Project.

- Retained vegetation will be maintained to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and reduce disturbance to surrounding habitat.

5.3.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- All areas of fencing during construction will be inspected as part of regular worksite inspections. Areas of higher risk exclusion fencing will be inspected at least weekly. Corrective actions include:
    - repair of any fencing found to be in poor condition or broken.

5.4 Erosion and sedimentation and changes in water quality and hydrology

The following measures will be implemented to mitigate and manage impacts of erosion and sediment:

- Erosion in active construction areas cannot be eliminated but can be controlled. As part of the construction planning a certified Erosion and Sediment Control Plan (ESCP) will be prepared prior to construction and implemented during on-site activities. Sediment and erosion control measures to prevent soil loss will be developed consistent with the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (BPESC) document. The ESCP will form part of the overall EMP. Particular focus will be given to managing runoff in the vicinity of watercourses.
- Design on site infrastructure to ensure water flows are not impounded or concentrated (e.g. culverts, diversion ditches, etc).
- The only open cut creek crossing location – Goonyella Creek – will take advantage of existing areas of cleared riparian vegetation as far as possible, and be carried out during periods of no flow. It is not a formed creek with defined banks.
- No equipment or materials will be stored across flow paths.
- The extent of the area required to carry out the permitted activity must be limited to the minimum area necessary to reasonably carry out the works.
- Construction equipment is to be maintained to minimise risk of spill or leakage.
- All refuelling facilities, or storage facilities for hydrocarbons and chemicals will be in appropriately designed sites and comply with Australian Standards (e.g. AS 1940: *The storage and handling of flammable and combustible liquids*). Materials will be stored within bunded areas with a storage capacity of 110% of the storage vessel. Bunding will have floors and walls lined with impermeable material. These areas must be adequately protected from rainfall and stormwater.
- Refuelling should not take place within 50 m of a watercourse.
- Spill control materials such as booms and absorbent materials will be maintained on site, commensurate with the types and volumes of materials in use, and in place where hazardous materials are stored or used.
- Personnel will receive appropriate spill clean-up training.

- Apply appropriate Australian and industry standards and codes of practice for the design of infrastructure associated with the storage of hazardous materials. Reagents and hazardous chemicals will be stored away from sensitive receiving environments and stored, handled and managed in accordance with:
    - relevant workplace health and safety (WHS) legislation
    - AS 1940:2017 *Storage and Handling of Flammable or Combustible Substances*
    - AS 3780:2008 *The Storage and Handling of Corrosive Substances*.
- Chemical storage areas are to be located away from existing drainage lines and have appropriate bunding and waste water collection mechanisms.
- Water and wastewater discharges will be treated to comply with conditions for discharge quality specified in the future environmental authority.
- Runoff from developed areas will be treated to remove pollutant loads before discharging to waterways. The expected pollutant loads from the respective areas will determine the method of treatment.
- During detailed design, issues relating to site runoff entering into drainage lines will be considered. These will include the preparation of a Stormwater Management Plan.
- Water drainage from the site will be managed in accordance with the surface water management design philosophy detailed in (EMM 2022a).
- Safety procedures will be developed to reduce the potential for exposure pathways to contaminated material.

5.4.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Daily dust suppression monitoring during clearing and construction. Corrective actions include:
    - further wetting down roads to suppress dust
    - temporary reductions in speed limits.
- Daily weather observation checks during clearing and construction. Corrective actions include:
    - cease works until weather passes to minimise sediment runoff and dust.
- Weekly checks of erosion and sediment control measures to ensure they are in working condition and effective. Corrective actions include:
    - cease works until weather passes to minimise sediment runoff and dust
    - implement additional erosion and sediment control measures if existing measures are not proving effective
    - notify government agencies of any spills and implement clean up measures required.

- Monitoring will be undertaken surrounding the development to characterise areas of potential contamination and monitor for any releases of contaminants. The monitoring would include soil, sediment, surface water in areas of concern and within down-gradient locations. This may take the form of visual monitoring initially depending on risk profile but will be confirmed in the EMP prior to construction.
- Corrective actions will involve investigation of the source of any contamination, and undertaking of repairs or replacement measures, as well as remedial actions as required.

5.5 Bushfire

The following measures will be implemented to mitigate and manage impacts from bushfire risks as much as practicable during the construction and operational phases:

- As part of the construction planning a certified Bushfire Management Plan will be prepared prior to construction and implemented during on-site activities. This will include details of controlled burning requirements, appropriate to the vegetation types present on the Project area. This will seek to manage the fuel load to reduce the risk of high-intensity fires occurring. The Bushfire Plan key provisions will include:
  - asset protection zones
  - maintaining access tracks to provide a fire break and defendable space to assist in arresting fires
  - bushfire risk mapping (considering slope, vegetation, aspect etc)
  - firefighting equipment being on site
  - emergency evacuation.
- During the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website. Contact and arrangements will be made with the local fire officers.
- For “hot-work” activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions.
- Vehicles may not idle or be parked in areas of long grass.
- Smoking will not be permitted on site aside from designated safe zones.

5.5.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions.

- Monthly assessment of fuel loads. Corrective actions include:
  - if fuel loads are increasing due to rainfall, review current measures and increase if required.
- During construction phase, and in the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website. Corrective actions include:
  - an Emergency Response Plan will be implemented should an uncontrolled fire take place.

5.6 Air quality and dust emissions

The following measures will be implemented to mitigate and manage impacts from dust as much as practicable during the construction phase.

- Areas which have potential to generate airborne dust will be wetted down regularly.
- Low speed limits will be implemented on site to minimise dust generation.
- Areas stripped of topsoil not required for operation will be rehabilitated as soon as practicable.
- Machinery and vehicle tyres will be regularly cleaned to reduce wheel entrained dust emissions or consider use of vibration grids.
- Design access roads to have a less erodible surface.
- Water spraying of nearby sensitive vegetation should be considered if visible dust sedimentation is observed.
- Dust and other emission levels will be adhered to under the State conditions of approval once the Development Application is approved.

5.6.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Daily dust suppression monitoring during clearing and construction. Corrective actions include:
  - further wetting down roads to suppress dust
  - temporary reductions in speed limits.
- Daily weather observation checks during clearing and construction. Corrective actions include:
  - cease works until weather passes to minimise sediment runoff and dust.

5.7 Weeds and pests

The following measures will be implemented to mitigate and manage impacts from weeds and pest animals as much as practicable during the construction phase:

- A Weed and Pest Management Plan will be developed for the Project with specific advice for key identified species. The plan will include management of weed spread, management of pest infestations, and monitoring effectiveness of control measures. The Project area is currently subject to high-levels of weed infestation and, as such, focus is to avoid further impacting the quality of retained areas of habitat along the riparian corridors.

- Parthenium weed (*Parthenium hysterophorus*) is abundant along the pipeline alignment, especially at the eastern end near Red Hill Road. This is a declared pest under the Biosecurity Act (QLD) so weed hygiene protocols will need to ensure it is not spread. It is also common on Denham Park. Additionally, although not recorded in the Project area, Rat's tail grasses (particularly Giant Rat's Tail Grass - *Sporobolus pyramidalis*/*S. natalensis* are identified as a high risk species for invasion of the Project area which can reduce pasture productivity and cause significant degradation of natural areas. Other high risk species for establishment include Fireweed (*Senecio madagascarensis*).

- Weed hygiene protocols will be implemented such as a dedicated vehicle and machinery cleaning bay. This will not be placed near a watercourse and runoff will be contained and the area treated. The location will be determined by property requirements.

- Hygiene protocols will be implemented to reduce the potential for introduction or spread of weeds. Measures will include:

    - Hygiene checks will focus on ensuring no weed plant material/seed/mud/soil material enters the site (or leaves known infestation areas within the site), with all machinery, vehicles and equipment including footwear will be cleaned prior to entering the site, and when working within a known contaminated area within the site, prior to exiting the contaminated area.

- Onsite waste disposal (especially food waste) to discourage presence of pest fauna. Waste will be stored in covered bins/skips to prevent fauna access.

- Weeds will be identified during pre-clearing surveys, in particular, any large infestations within proposed disturbance areas. Clean and dirty zones should be demarcated on site to facilitate weed management.

- Any materials brought into site (such as gravel) will be certified as weed and disease free.

- Any herbicides used on site must be dispensed by an appropriately trained and qualified weed sprayer.

- Access into retained areas of habitat during construction will be limited and monitoring of weeds in these areas in place.

5.7.1 Proposed monitoring and corrective actions

The following monitoring will be undertaken to verify the implementation of the above management and mitigation actions:

- Record weed species during pre-clearance surveys, and confirm any large infestations required for treatment prior to clearing. Corrective actions include:

    - weed control efforts to be increased if needed

    - weed control methods to be adjusted if current techniques are not proving effective.

- Check wash downs are occurring in an effective manner during regular audits. Corrective actions include:

    - increase hygiene protocol requirements if vehicles or equipment are found to introduce new weeds.

- Check material being brought into site such as gravel is weed and disease free:

    - increase hygiene protocol requirements if vehicles or equipment are found to introduce new weeds.

5.8 Rehabilitation

The following measures will be implemented to facilitate rehabilitation within the Project area:

- Those areas which are not required for the ongoing operation and maintenance of the Project will be rehabilitated to as soon as practicable following construction.
- Restoration and revegetation will be detailed in a VMP to be prepared prior to commissioning of the Project. Methods for habitat restoration, will also be described which may include soil stabilisation, direct seeding, managing natural regeneration and weed management.
- Woody debris, logs and rocks will be retained for use in rehabilitation.
- Where seeding and/or revegetation is required select plant species that are found in similar adjacent habitat on site. This may include use of an inert initial colonisation species to assist in groundcover and stabilisation.

In order to undertake all aspects of rehabilitation, decommissioning of infrastructure is likely to be required. This includes the de-mobilisation and removal of buildings, plant and equipment and hard stand areas. The buried pipeline would remain in place. A Rehabilitation and Decommissioning Management Plan will be developed and submitted to the relevant authority 12 months prior to decommissioning occurring.

6 Compliance

6.1 Delegation of authority

QPM Energy will be responsible for the construction of the Project and will manage the construction contractor. QPM Energy, the principal contractor and all site personnel will be responsible for implementation of measures in the EMP and VMP.

Table 6.1 Responsible personnel

Role	Responsibilities
Project manager	• Handover of design requirements to Construction Manager. • Ongoing accountability for Project delivery. • Managing construction work and managing Project personnel listed below.
Construction manager	• Managing construction work of the Project. • Approval of the final VMP. • Approval of design changes and obtaining any required planning approvals. • Reporting and responding to incidents on site. • Ensuring the environmental performance during the construction phase.
Environmental manager	• Reviewing the VMP and ensuring management and mitigation methods are carried out accordingly. • Delivering site inductions. • Conducting environmental audits. • Monitoring implementation of environmental controls. • Reporting and responding to incidents on site. • Ensuring all appropriate permits are in place (e.g. Critically Endangered, Endangered, Vulnerable and Near Threatened (CEEVNT) flora clearing permit).
Traditional owner	• Cultural Heritage Survey prior to and following clearing. • Identification, documentation and relocation of artefacts. • Identification, documentation and relocation of culturally significant flora.
Suitably qualified ecologist	• Co-ordinate and lead pre-clearance surveys to identify CEEVNT flora, animal breeding places and introduced flora.
Site personnel	• Reporting incidents, emergencies or other environmental incidents to the Environmental Manager and Construction Manager. • Understand environmental controls. • Conduct activities with environmental due diligence.

6.2 Inductions and training

It is essential that all site personnel, including Managers, are aware of the ecological values within the Project area, the potential for environmental impacts to occur, and the management and mitigation measures that are to be followed to avoid, minimise, and mitigate impacts. The following training methods will be undertaken to ensure personnel are well trained and environmentally aware.

6.2.1 Environmental awareness induction

All site personnel will be required to attend an environmental awareness induction prior to arriving to site. The induction will cover the following aspects:

- objectives of the VMP and associated environmental controls (including hygiene protocols)
- briefing on potential CEEVNT flora and weed species within the Project area
- individual's and organisation's environmental obligations
- restricted and 'no-go' areas
- procedures for responding to environmental incidents and emergencies
- responsibilities for environmental monitoring and reporting.

6.2.2 Pre-start meetings

All site personnel will be briefed on environmental requirements, focusing on practical measures, during daily pre-start meetings. Pre-start meetings will cover the following aspects:

- changed environmental conditions
- vegetation clearing demarcations
- any CEEVNT flora species or sensitive communities in proximity to the work area
- vehicle speed limits.

6.3 Incident management

An incident investigation procedure and reporting form will be developed by the construction contractor as part of the EMP.

6.3.1 Emergency response

An Emergency Response Plan will be developed as part of the EMP and will include measures around emergencies directly related to vegetation.

References

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023a). *Dichanthium queenslandicum* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023b). *Dichanthium setosum* in Species Profile and Threats Database, Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of the Environment (DoE) (2008). Approved Conservation Advice for *Dichanthium setosum* (Blue-grass). Commonwealth of Australia.

Department of the Environment (DoE) (2013a). Approved Conservation Advice for *Dichanthium queenslandicum* (King Blue-grass). Commonwealth of Australia.

Department of State Development, Infrastructure and Planning (DSDIP) 2014. Significant Residual Impact Guideline – for matters of state environmental significance and prescribed activities assessable under the Sustainable Planning Act 2009. Queensland Government.

EMM Consulting Pty Ltd (EMM) 2022. MNES Assessment Report. Prepared for QPM Energy Pty Ltd.

Neldner, VJ, Wilson, BA, Dillewaard, HA, Ryan, TS, Butler, DW, McDonald, WJF, Richter, D, Addicott, EP & Appleman, CN (2022). *Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland Version 6.0*. Queensland Government.

Appendix A
Flora species list

EMM
creating opportunities

Table A.1 Flora species list

Scientific name	EPBC Act status	Likelihood of occurrence	Rationale
Bertya opponens	Vulnerable	Unlikely	No records exist in the study area, and the habitat types are not present in the Project area. This species is unlikely to occur.
Dichanthium queenslandicum	Endangered	Unlikely	Due to a lack of suitable native grasslands and extensive areas of Buffel Grass along with cattle grazing, the species is considered unlikely to occur in much of the alignment. There are 26 records within the study area. Extensive field surveys failed to detect the species.
Dichanthium setosum	Vulnerable	Unlikely	Due to a lack of suitable native grasslands and extensive areas of Buffel Grass along with cattle grazing, the species is considered unlikely to occur in much of the alignment. No records exist within the study area. The nearest record is 40 km to the east from Hail Creek. Extensive field surveys failed to detect the species.
Eucalyptus raveretiana	Vulnerable	Unlikely	No records of this species exist within the study area with the closest record being approximately 40 km east of the Project area. This species occurs in riparian (river) habitats, which are not present in the Project area, and this species was confirmed to be absent. As such the species is considered unlikely to occur.
Samadera bidwillii	Vulnerable	Unlikely	No records exist in the study area, and the habitat types are not present in the Project area. This species is unlikely to occur.
Solanum graniticum	Endangered	Unlikely	The Project area is well outside the known geographical range of the species and suitable habitats do not exist. Therefore, the species is considered unlikely to occur.

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Appendix I

Fauna Management Plan

QUEENSLAND PACIFIC METALS

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Fauna Management Plan

QPM Energy Project

Prepared for QPM Energy Pty Ltd

March 2023

Fauna Management Plan

QPM Energy Project

QPM Energy Pty Ltd

E221165 RP1

March 2023

Version	Date	Prepared by	Approved by	Comments
V1	26 January 2023	Anna McRae	Susan Lodge	Draft
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Approved by

Susan Lodge
Associate Environmental Consultant
9 March 2023

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Abbreviations

The following abbreviations are used in this report:

Abbreviations used in this report

Abbreviation	Term
AS	Australian Standard
BS Act	*Biosecurity Act 2014*
BPESC	Best Practice Erosion and Sediment Control
CEEVNT	Critically Endangered, Endangered, Vulnerable and Near Threatened
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science
EA	Environmental Authority
EMM	EMM Consulting Pty Ltd
EMP	Environmental Management Plan
EO Act	*Environmental Offsets Act 2014*
EO Regulation	Environmental Offsets Regulation 2014
EP Act	*Environmental Protection Act 1994*
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
ERA	Environmentally Relevant Activity
ESCP	Erosion and Sediment Control Plan
EVNT	Endangered, vulnerable or near threatened
FMP	Fauna Management Plan
GCF	Gas Compression Facility
ha	Hectare
HVR	High value regrowth
IECA	International Erosion Control Association
km	Kilometres
LGA	Local government area
m	Metres
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992*
NQGP	North Queensland Gas Pipeline
QEOP	*Queensland Environmental Offsets Policy V1.6*

Abbreviations used in this report

Abbreviation	Term
QPM	Queensland Pacific Metal Pty Ltd
RE	Regional ecosystems
ROW	Right of way
SMP	Species Management Program
SEVT	Semi-evergreen vine thicket
TEC	Threatened ecological communities
TECH	Townsville Energy Chemicals Hub
VM Act	*Vegetation Management Act 1999*
VMP	Vegetation Management Plan
WHS	Workplace Health and Safety

1 Introduction

1.1 Background

Queensland Pacific Metals (QPM) Energy is the proponent of the QPM Energy Project (the Project). The Project involves the design, construction, and operation of a gas compression facility (GCF) and a high-pressure pipeline that links the proposed GCF to the nearby existing and operational North Queensland Gas Pipeline (NQGP).

The Project proposes to collect waste coal mine gas at the proposed GCF via waste gathering lines from existing adjacent mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP. The NQGP will then transport the compressed gas north to Townsville, where it will be depressurised and distributed, by a third party, to industrial users, including QPM's Townsville Energy Chemicals Hub (TECH) Project.

EMM Consulting Pty Limited (EMM) has been commissioned to undertake ecological assessments for the Project including the identification of environmental matters prescribed at Commonwealth and State levels across the Project area and associated impact assessments. EMM has been working with QPM Energy and has contributed to the Project design including identification of appropriate mitigation measures to reduce environmental impacts and maximise beneficial environmental outcomes.

1.2 Purpose of this report

The purpose of this draft Fauna Management Plan (FMP) is to establish an environmental management framework for managing impacts on native fauna during the design, construction, and operational phases of the Project. This FMP aims to:

- Assess the potential impacts of the Project on native fauna, threatened fauna species and associated habitats identified in the Matters of National Environmental Significance (MNES) Assessment Report (EMM 2021a) that may be at risk from the Project.

  Provide recommendations for avoidance, mitigation and management of potential impacts to maintain these ecological values associated with native fauna in the Project area.

The plan will be updated prior to commencement based on the detailed design and construction contractor method statements. It is likely that it will be incorporated into a Species Management Program (SMP) which is a requirement for a proposed activity that will have an unavoidable impact on breeding places of protected animals. This includes all classes of native wildlife including least concern as referred to in Section 2.2.

1.3 Project details

1.3.1 Project area

The Project is proposed 43 km north of Moranbah, a coal mining town and locality within the Isaac Regional Council local government area (LGA).

The region is heavily disturbed with extensive mining (both open cut and underground) and grazing activities throughout.

The proposed high-pressure pipeline is situated over two properties, comprising the following lot/plans:

- Lot 23 on SP262530, herein named Lot 23 (Denham Park)
- Lot 11 on SP262530, herein named Lot 11 (Denham Park)

- Lot 2 on SP214117, herein named Lot 2 (Dabin Station).

The high-pressure pipeline also crosses (via underboring, with no surface impacts):

- Lot 100 on SP235905 (operational railway, Goonyella System)
- the Sunwater Moranbah and Eungella pipelines.

The Project area also includes a 40 m buffer from the proposed high-pressure pipeline corridor which is 30 m in width (total width surveyed along the alignment is 110 m). This buffer also intersects a small portion of Lot 14 on CP846391 (Burton Downs), herein named Lot 14, as well as Lots 23, 11 and 2.

The proposed GCF and access road are located on Lot 2, and is also buffered by 40 m, for the purpose of the ecological assessment.

Additionally, a 20 km buffer from the project area has been applied and is referred to as the study area.
The project area is shown on Figure 1.1.

For the purpose of this report, the following definitions are used:

- Project footprint – the location of the proposed pipeline, GCF and ancillary facilities and the area which will be directly disturbed by the project.
- Project area – is the project footprint within a 40 m buffer from the pipeline corridor, GCF and access track.
- Study area – 20 km buffer from the project footprint.

1.3.2 Project components

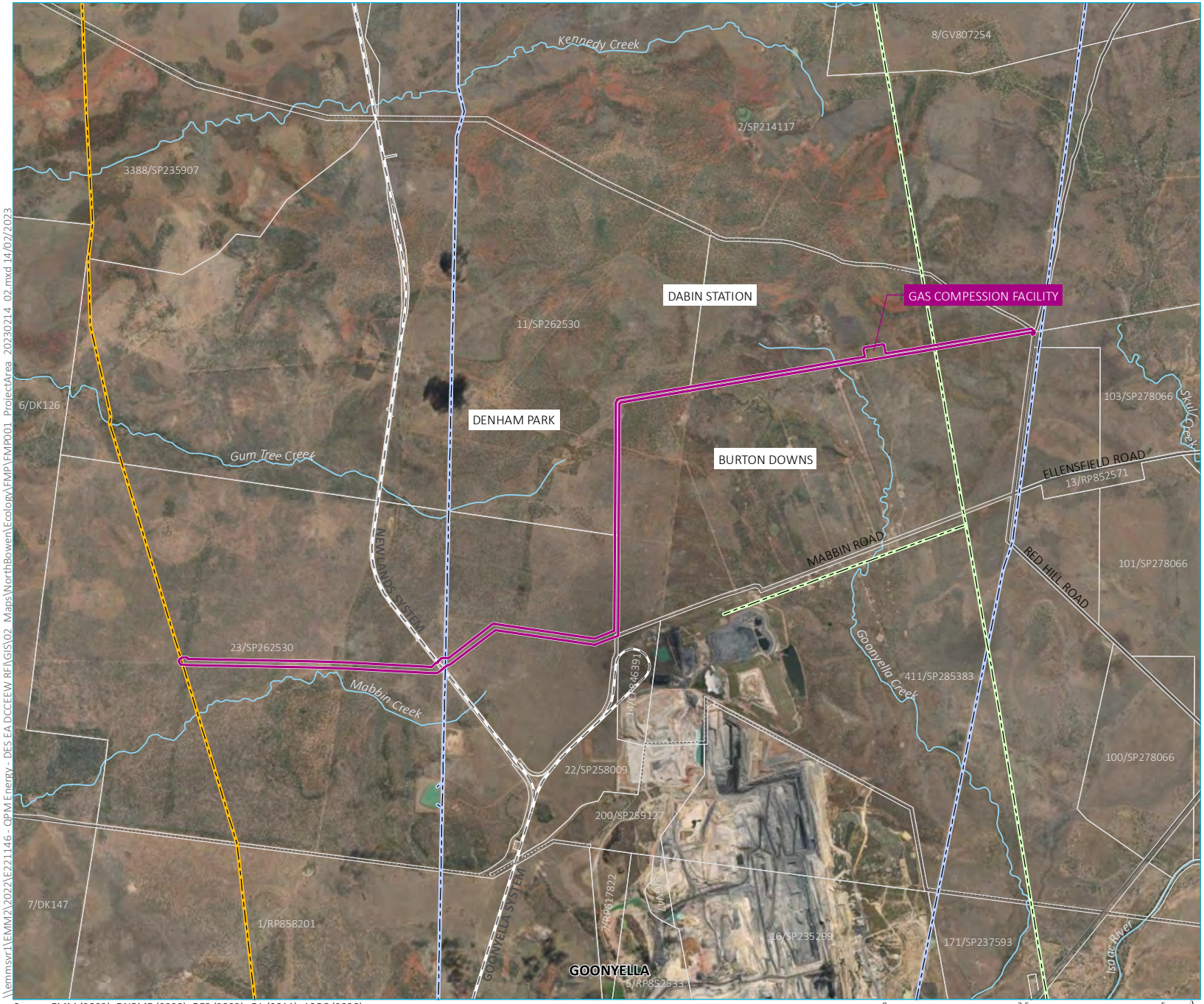
Table 1.1 describes the key components of the Project.

Table 1.1 Project components

Component	Description
Gas Compression Facility	• Captures and converts waste coal mine gas to clean gas. • Proposed to be located at Dabin Station on the southern boundary of Lot 2 SP214117 and 2.7 km west of the Red Hill Road reserve. • Sited on a 200 m by 300 m area. • 6 ha disturbance footprint.
High-pressure pipeline	• High-pressure pipeline to transport clean gas from the GCF to the NQGP. • 16.8 km in length, running along cleared areas, fence lines and fire breaks along property boundaries. • During construction, a 30 m wide construction right of way (disturbance area of 51 ha). • During operations, a 15 m wide operating easement (disturbance area of 25 ha) from 3.2 km from the GCF.
Access road	• Road to provide all-weather access to the GCF from Red Hill Road reserve. • 2.8 km long and 30 m wide. • 8 ha disturbance footprint

The Project is defined by limits which include:

- road connection to Red Hill Road
- GCF inlet flange/s to the facility from gas gathering systems on adjacent mining tenures
- connection to the NQGP (via hot tap)
- GCF clean water pipeline flange returning water to the relevant existing mine water management systems
- rainfall run-off from an on-site settling basin
- high-pressure pipeline easements (30 m wide Right of Way (ROW)) during construction and reduced to 15 m ROW during operations from 3.2 km from the GCF boundary).



KEY

- Project area
- Electrical transmission line
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary

INSET KEY

- Main road
- National park
- State forest

Project area

QPM Energy Project
Fauna Management Plan
Figure 1.1

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\FMP\FMP001 ProjectArea 20230214 02.mxd 14/02/2023

Source: EMM (2023); DNRME (2022); DES (2022); GA (2011); ASGC (2006)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

EMM creating opportunities

2 Legislation

Primary approvals for the Project are being sought under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environmental Protection Act 1994* (EP Act). These approval processes are being progressed concurrently.

A summary of the key legislation, policies and guidelines that have informed the design and implementation of field ecology surveys and impact assessments is provided in the following sections.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC)

The EPBC Act is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places — defined in the EPBC Act as MNES.

There are known MNES within the Project area. A referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (EPBC2022/09329) was lodged in October 2022. The Project was determined to be a controlled action and for assessment via the preliminary documentation pathway.

2.1.2 EPBC Act Environmental Offsets Policy

Environmental offsets are required to be delivered in accordance with the EPBC Act Environmental Offsets Policy (DoEE 2012). The Environmental Offsets Policy outlines the Australian Government's approach to the use of environmental offsets (offsets) under the EPBC Act. Offsets are defined as measures that compensate for the residual adverse impacts of an action on the environment. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act (DoEE 2012).

Avoidance and mitigation measures are the primary strategies for managing the potential significant impact of a proposed action. Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any residual significant impact. Where significant impacts are found to occur to MNES, and environmental offsets are required, an offsets package should be provided. An offsets package is a suite of actions that a proponent undertakes in order to compensate for the residual significant impacts to the identified MNES. It can comprise a combination of direct offsets and other compensatory measures.

Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain (DoEE 2012). To support any offset assessments that may be required it will be important to evaluate the specific MNES attributes that occur within the proposed disturbance area (e.g. whether foraging habitat or breeding habitat) and the habitat quality of mapped habitat areas. This information is required to inform offset calculations.

2.2 State

2.2.1 Environmental Protection Act 1994 (EP Act)

The Project will require a material change of use for an environmentally relevant activity (ERA). The ERA will require an environmental authority (EA) to be issued under the *Environmental Protection Act 1994* (QLD) (EP Act). As part of the application, an environmental impact assessment is required to be undertaken to assess the potential for environmental impacts, and identify how those impacts will be avoided, reduced and mitigated. As part of the impact assessment, the presence of matters of state environmental significance (MSES) within the proposed impact areas will need to be identified, and determination made as to whether the proposed actions would result in a 'significant' residual impact to MSES.

If a significant impact is considered likely to occur to MSES, environmental offsets will be conditioned through the EA, and they will need to be delivered in accordance with the *Environmental Offsets Act 2014* (EO Act). This will be assessed applying the Significant Residual Impact Guideline (DEHP 2014)

2.2.2 Nature Conservation Act 1992 (NC Act)

For a proposed activity that will have an unavoidable impact on breeding places of protected animals (which include all classes of native wildlife including least concern), a Species Management Program (SMP) is required to be prepared and approved by the Department of Environment and Science (DES) under the *Nature Conservation Act 1992* (NC Act). DES has prepared an Information Sheet that outlines when a SMP is required. Animal breeding places are defined in this document as: a bower; burrow; cave; hollow; nest; or other thing that is commonly used by the animal to incubate or rear the animal's offspring.

A Low Risk SMP can authorise tampering with animal breeding places for least concern species. A High Risk SMP will authorise tampering for all fauna breeding places including colonial breeders, special least concern and Critically Endangered, Endangered, Vulnerable and Near Threatened (CEEVNT) species. The duration of the SMP must be identified and must be relevant to the activity being undertaken and allow for a periodic review of the program. The standard term for an SMP is three years.

The purpose of an SMP is to:

- assess the threats to native animal breeding places resulting from a planned activity
- incorporate management actions that will avoid or minimise both the immediate and the long-term impact of removing or altering an animal breeding place
- set monitoring and reporting requirements that demonstrate the management actions in the SMP are effectively implemented and produce the intended results.

The seasonal terrestrial ecology surveys have included habitat assessments and identification of animal breeding places. This information will be used at a later date to support the preparation of an SMP as required.

2.2.3 Biosecurity Act 2014

The *Biosecurity Act 2014* (BS Act) provides a legislative framework to manage pest fauna and pest flora, diseases, and environmental contaminants, to address the impacts they have on the economy, environment, agriculture, tourism, and society. The Act prohibits or restricts the introduction and spread of declared plant and animal pests within Queensland. Weeds and pest animals pose threats to flora and fauna and agriculture uses within the Project area.

Field ecology surveys identified the presence of pest plants and animals within the Project area. The presence of weeds species in the Project area and their proposed control are addressed in this FMP.

2.2.4 Fisheries Act 1994

Development that has potential to impact on fish passage may require approval under the *Planning Act 2016*. Waterway barrier works may inhibit the free movement of fish along waterways and onto floodplains, injure fish and affect fish health and habitat. Waterways for the purposes of the Fisheries Act are defined by the Queensland Government mapping layer Queensland Waterways for Waterway Barrier Works. It is recognised this layer may not be accurate on the ground therefore the responsibility for ensuring appropriate procedures are employed rests with the user. Waterways are colour coded based on level of risk. Streams higher in the catchment generally have reduced habitat area and steeper slopes supporting smaller populations of fish, therefore these are of lower risk than larger streams lower in the catchment.

2.2.5 Environmental Offsets Act 2014

In Queensland there is an offsets framework governed by a range of legislation, policies and guidelines to support a determination as to when environmental offsets are required, and how they are to be delivered. The Queensland Offsets Framework includes:

- *Environmental Offsets Act 2014* (Qld)
- Environmental Offsets Regulation 2014 (Qld) (EO Regulation)
- *Queensland Environmental Offsets Policy* (QEOP) (version 1.6)
- *Significant Residual Impact Guideline* – for prescribed activities under NC Act, EP Act and Marine Parks Act (DEHP 2014).

Under the Queensland Environmental Offsets Framework an environmental offset is required when a significant, residual impact occurs to an MSES. MSES are prescribed in Schedule 2 of the EO Regulation and include:

- endangered and vulnerable flora and fauna species under NC Act and their habitats
- special least concern fauna species under NC Act and their habitats
- endangered and of concern regional ecosystems (REs) under *Vegetation Management Act 1999* (VM Act)
- essential habitat (mapped by DES)
- REs that intersect with wetlands and watercourses
- connectivity values
- wetlands of high ecological significance
- protected areas (including nature refuges)
- declared fish habitat areas and waterways providing for fish passage
- legally secured offset areas.

2.3 Survey guidelines

The timing and survey methods adopted for ecological surveys were guided by the applicable Queensland and Commonwealth survey guidelines. Vegetation community survey methods were consistent with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*, Version 5.1 (Neldner et al. 2020).

Targeted surveys were designed and implemented in accordance with the following guidelines:

- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* – Version 3.0 (Eyre et al. 2018)
- *Survey guidelines for Australia's threatened reptiles* (DSEWPC 2011a)
- *Survey guidelines for Australia's threatened mammals* (DSEWPC 2011b)
- *Survey guidelines for Australia's threatened bats* (DEWHA 2010a)

- *Survey guidelines for Australia's threatened birds* (DEWHA 2010b)
- *Survey guidelines for Australia's threatened frogs (DEWHA 2010c)*
- *Referral guidelines for the vulnerable Koala (DoE 2014)* – now superseded
- *Draft referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPC 2011c).*

3 Existing environment and ecological values

3.1 Field survey activities

An initial walkover of the Project area was undertaken between 6–9 December 2021 by Sandra Walters and supported by Daniel Kelly. The walkover included general habitat assessments, incidental threatened flora, and fauna searches.

The second round of field surveying occurred between 7–12 March 2022, led by Sandra Walters and Andrew Jensen and supported by Daniel Kelly and Elliot Leach. The March survey represents a late wet season/autumn seasonal survey for the Brigalow Belt bioregion under the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (Eyre et al. 2018). This coincides with an active period for fauna including dispersal and migration of many species. It is also more likely to be moist from summer rainfalls, than during the spring to early summer period, and overlaps with grass reproduction and propagation, which is important for granivores.

Further surveying was completed between 28 June – 1 July 2022, led by Sandra Walters and supported by Elliot Leach. These surveys focussed on verification of regional ecosystems present, potential for threatened ecological communities (TEC) and species habitat mapping.

A final field survey was completed by a team of two EMM ecologists, led by Elliot Leach and supported by Rachel Scott between 21–24 November 2022 on Lot 11 and Lot 2, to undertake spotlighting for MNES species potentially present, particularly Koala, Greater Glider and Ornamental Snake.

A summary of the fauna survey methods and results are outline in the MNES Preliminary Documentation (EMM 2023), the key findings are as detailed below.

3.2 Fauna habitats

The site is heavily disturbed by current and historical land uses including livestock grazing and mining. The site is predominantly non-remnant with minor areas of remnant vegetation. Pre-clearing vegetation consisted primarily of brigalow woodland, which has been broadscale cleared, raked, and seeded with the exotic pasture species, Buffel Grass.

Despite disturbance, the high-pressure pipeline alignment on Lot 23 contains an abundance of gilgai habitat which transforms rapidly to freshwater wetlands after rain. These short-lived wetlands provide suitable habitat for a range of cryptic species that are difficult to detect when conditions are dry (e.g. burrowing frogs and ornamental snake).

General habitat assessments were completed across the Project area. Specific habitat attributes were analysed at each site to confirm suitable habitat features for particular CEEVNT species and provide justification for the potential presence or absence of a species due to the presence or absence of suitable microhabitats.

Most habitat observed across the survey area is considered of relative low quality due to broad-scale vegetation clearing, cattle grazing, weed encroachment and proximity of mining operations. Remaining vegetation in the survey area is largely fragmented with useful habitat limited in extent.

Broad habitat groups have been described across the survey area with their features and ecological values discussed below. Threatened fauna species that have potential to occur in the broad habitat groups are also mentioned.

i Eucalypt and acacia woodland

Eucalypt and Acacia woodlands are the dominant woodland types where remnant vegetation still occurs.

Eucalypt woodlands provide seasonal food resources for nectar-feeding birds and flying-foxes, and where present, nest/roost sites in the form of tree hollows for birds (such as parrots), microbats, possums, gliders and other small mammals. Grazing practices and weed encroachment further reduced the quality of these corridors.

Remnant woodland vegetation showed the most value as it occasionally exhibited large hollow bearing trees, representing potential fauna breeding places. However, the abundance of tree hollows was noted to be low throughout, reducing the quality of habitat for species such as Greater Glider as suitable denning habitat is significantly reduced.

Shrubs were relatively sparse, but a grassy ground layer occurs providing cover for ground fauna (for example, Rufous Bettong (*Aepyprymnus rufescens*) were observed in these habitats). Large fallen timber was common in areas, providing potential shelter for a variety of ground fauna including reptiles and native rodents.

There is limited potential for Koala to occur in these habitats as riparian vegetation is generally sparse and of low quality.

The section mapped as remnant 'Of concern' RE 11.5.3/11.5.15 is characterised by *E. crebra/Corymbia clarksoniana* (Clarkson's Bloodwood) woodland approximately 14 m in height and 20–30% canopy cover, on red sand with minor clay content. An understorey of Semi-evergreen vine thicket (SEVT) species is prominent in some areas, consisting of species such as *Bursaria incana (*Prickly Pine*), Brachychiton rupestris (*Narrow-leaved Bottle Tree*), Brachychiton* australis (Broad-leaved Bottle Tree) and *Denhamia oleaster* (Stiff Denhamia). However, the secondary tree and shrub layers frequently included species more commonly associated with RE 11.5.3 such as *Erythroxylum australe* (Cocaine Bush), *Ventilago viminalis* (Vine Tree), *Eremophila mitchellii* (False Sandalwood) and *Cassia brewsteri* (Bean Tree). RE 11.5.3 is the correct mapping for this area.

Areas mapped as high value regrowth (HVR) RE 11.5.3/11.5.15 are similar to the Narrow-leaved Ironbark woodland with SEVT understorey recorded on Lot 11, however is regrowth vegetation that has been previously cleared. Average height of the canopy is 11–12 m with 20–30% cover, on red sandy soil. This is consistent with remnant vegetation of RE 11.5.3, which is described as *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces. *Eucalyptus populnea* is not present, however *E. crebra* is noted in the RE description as being locally dominant in some areas.

Further east, regrowth Brigalow woodland (7–8 m tall) interspersed with Blackbutt-dominated woodland is present on red-brown sandy clay soils, as shown in Photograph 3.2. This is consistent with Endangered REs 11.4.9/11.4.8, however is mapped as High Value Regrowth of Endangered RE 11.8.13, which is described as semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks. Exotic grasses are very sparse in the ground layer, comprising ~5% of cover. As such, this patch would qualify as the Brigalow TEC.

A section of HVR 11.4.9/11.4.8 (Brigalow 5–6 m tall with emergent, interspersed taller Blackbutt to 16 m) is present east of this patch. This patch is incorrectly mapped as a heterogeneous polygon of 'Of Concern' RE 11.8.11/11.8.5, which are grassland-dominant REs, and are not present. To the east of the Brigalow community is open grassy woodland dominated by *Eucalyptus orgadophila* (Mountain Coolibah), with scattered *Corymbia clarksoniana* on dark brown cracking clay soil, consistent with 'Least Concern' RE 11.8.5. The canopy is very sparse (~10% cover) which is typical of the community, with an almost absent shrub layer (~1% cover) containing *Alectryon diversifolius* and *Santalum lanceolatum* (Sandalwood). Buffel Grass and Parthenium dominate the ground layer, particularly at the edges of the community along the road.

Photograph 3.1 ***Eucalyptus crebra*** **woodland with SEVT understorey species on Lot 11**

Photograph 3.2 **Remnant Brigalow/Blackbutt woodland on Lot 2**

Photograph 3.3 **HVR Brigalow with interspersed taller Blackbutt on Lot 2**

Photograph 3.4 *Eucalyptus orgadophila* grassy open woodland incorrectly mapped as SEVT on Lot 2

ii Acacia regrowth and gilgai

Acacia regrowth communities were widespread across the survey area (primarily Brigalow (*Acacia harpophylla*) dominated communities where this community had been previously cleared for grazing). Most of these areas were characterised as small fragmented areas of regrowth surrounded by grazing land. Habitat value was generally low in these areas as they frequently showed limited groundcover and shrub-layers with exotic understoreys, and a lack of hollow bearing trees. However, leaf litter and fallen woody debris was recorded at some sites, providing microhabitat features for small reptiles and terrestrial mammals. Sites possessing abundant coarse woody debris and leaf litter, cracking clays or gilgai are considered potential habitat for the Ornamental Snake.

The high-pressure pipeline alignment of Lot 23 passes through entirely non-remnant vegetation, with the exception of a small area in the eastern half containing mapped HVR of Endangered RE 11.4.9 *Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains.* Review of the aerial imagery indicates that the majority of the alignment was disturbed through vegetation clearing between 1987 and 2000, and clearing has continued since. Mapped vegetation on Lot 23 was ground-truthed in March 2022 and June 2022. Quaternary site assessments were completed at 10 locations within non-remnant vegetation across the proposed high-pressure pipeline route, to confirm the accuracy of the certified mapping. Extant vegetation comprised disturbed grassland dominated by Buffel Grass, *Eragrostis* species (Wiregrass) and *Sida cordifolia* (Flannel Weed). Gilgai occurred frequently, within which the dominant grass species was frequently *Leptochloa ligulata (syn Dinebra ligulata)* (Spangletop). Soils were uniformly brown heavy cracking clay.

The non-remnant vegetation mapping in the north-south alignment is correct. This area has been previously cleared with recent follow-up clearing of the shrub layer evident. The ground layer contains dense Buffel Grass varying in dominance of between 30% and 50%. The native bluegrass, *Dichanthium sericeum* dominates in some areas, particularly to the north of the fence which forms the Lot 11/Lot 23 property boundary. Low shrubs of approximately 1 m in height are scattered throughout the grassland, and comprised of species typical of Brigalow woodland, including *Terminalia oblongata* (Yellow Wood), *Ehretia membranifolia* (Peach Leaf), *Alectryon diversifolius* (Scrub Boonaree) and *Carissa ovata* (Currant Bush). Soils are dark brown heavy cracking clay soils, and gilgai are common. Some gilgai still contained water during the June 2022 field visit, however were heavily degraded through trampling by cattle.

Areas of gilgai are widespread across the survey area particularly on clay soils but vary significantly in state of degradation. Most areas exhibit shallow, open gilgai with little remaining vegetation. However, some patches remain in relatively good health exhibiting vegetated areas of Umbrella Canegrass (*Leptochloa digitata*), generating ample cover for frog, bird and reptile species. Areas of gilgai in the survey area are considered potential habitat for the Ornamental Snake with deeper, more heavily vegetated and deeper cracking areas most preferred. Additionally, these gilgai provide suitable habitat for the Australian Painted Snipe and Latham's Snipe during suitably wet conditions.

Photograph 3.5 Inundated gilgai containing *Leptochloa ligulata* on Lot 23

Photograph 3.6 Brigalow regrowth within gilgai habitat (also a fauna survey site)

iii Non-remnant vegetation

Previously cleared areas dominate much of the survey area with a large proportion recently or currently utilised for cattle grazing activities. Vast areas are completely dominated by Buffel Grass with some expanses supporting no other species of grasses. Small areas continue to support native grass species such as Queensland Bluegrass (*Dichanthium sericeum*) but these were recorded in very low densities.

With limited structural and floristic diversity, non-remnant grassland habitats supported limited fauna diversity in comparison to remnant habitats, but provide habitat for certain grassland-dependent species such as Eastern Grey Kangaroo (*Macropus giganteus*).

Much of these areas of non-remnant vegetation are considered of low ecological value but some species may occasionally use these areas i.e. Short-beaked Echidna (*Tachyglossus aculeatus*). Open country bird species such as Australasian Pipit (*Anthus novaeseelandiae*) and Horsfield's Bushlark (*Mirafra javanica*), as well as a few species of buttonquail.

Partially cleared and cleared areas offer habitat for species that typically prefer open grassy woodlands such as Squatter Pigeon.

Photograph 3.7 Disturbed grassland dominated by Buffel Grass within the pipeline alignment, Lot 23

3.3 Threatened fauna

Three threatened fauna species under the EPBC Act were recorded over the three survey periods being:

- Ornamental Snake (*Denisonia maculata*) – after heavy rain on 10 March 2022, a total of nine individuals were recorded on Lot 23 and on the following night, a total of 30 individuals were recorded in the same area. All individuals were in the gilgai on the eastern part of the property, although it is likely individuals would have been recorded in the western part of the alignment too if this area had been accessed (was not possible due to flooding). In November 2022, five Ornamental Snake were recorded on the southern part of Lot 11 in gilgai habitat, although the species is expected on the whole north-south alignment on this lot.

  Additionally, the species has potential to occur in parts of Lot 11 and Lot 2 where Brigalow communities on clay soils are present adjacent to extensive areas of gilgai on the east-west alignment. These areas are mapped as potential dispersal habitat. These areas were spotlit in November 2022 although no Ornamental Snakes were recorded in these areas.

- Squatter Pigeon (*Geophaps scripta scripta*) – Squatter Pigeons were observed on four different occasions while traversing the Project area in March 2022, and once in June 2022. This comprised groups of one, two, five and eight individuals all in the same vicinity around the dam on Lot 23 during March 2022. A group of four birds were seen in the same area in June 2022. The disturbance footprint will impact the location where Squatter Pigeon have been consistently observed.

Squatter Pigeons are typically found in remnant or regrowth habitats dominated by Eucalyptus, Corymbia, Acacia or Callitris species within 3 km of available surface water (DAWE 2022b). Breeding habitat is within 1 km of a water source (DAWE 2022b). Permanent or temporary water is available across the Project area in the form of the abovementioned farm dam, as well as other small dams in the vicinity of the Project area. Additionally, mildly disturbed or cleared habitats along vehicle tracks or on the peripheries of the Project area represent ideal habitat for this species.

Utilised habitat in these areas have low ground layer cover, typically below 33%. Areas within the Project area containing dense grassy understorey dominated by Buffel Grass, with limited availability of permanent water are not considered suitable habitat for Squatter Pigeon. However, where the ground cover is sparser, and particularly in proximity to permanent surface water (e.g. farm dams) are considered suitable habitat.

- White throated Needletail (*Hirundapus caudacutus*) was recorded close by (within 3 km) along the old alignment. White throated Needletails migrate north and have largely left Australia by April to breed in the Northern Hemisphere. As this species is strictly an aerial feeder it would use the entire area as foraging habitat.

The following additional species are considered to be likely to occur in the Project area or have been assessed conservatively due to being high-priority species:

- Koala (*Phascolarctos cinereus*)
- Australian Painted Snipe (*Rostratula australis*)
- Latham's Snipe – (*Gallinago hardwickii*) migratory
- Fork-tailed Swift – (*Apus pacificus*) migratory
- Oriental Cuckoo – (*Cuculus optatus*) migratory.

Threatened fauna records are shown on Figure 3.1. Habitat mapping is shown on Figure 3.2 to Figure 3.5.

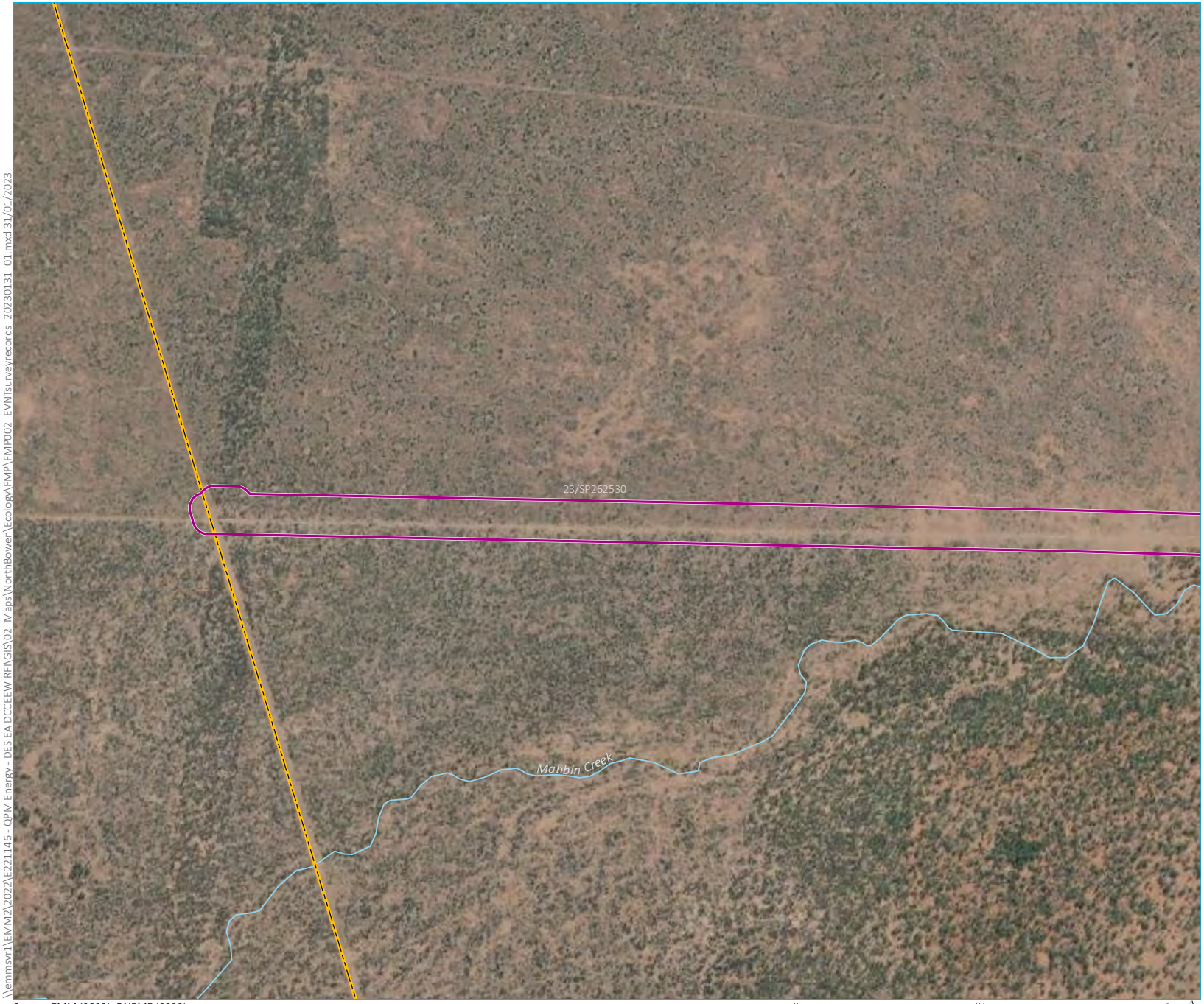
3.4 Non-EVNT fauna observations

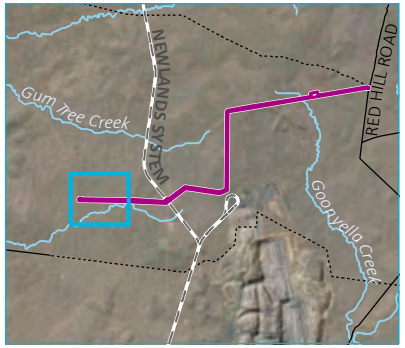
Incidental sightings of non-endangered, vulnerable or near threatened (EVNT) fauna were recorded throughout the Project area during surveys. These species are listed in Appendix A. Of note were multiple occurrences of *Notaden bennettii* after heavy rains on 10 March 2022, at the north-eastern extent of their range and again in November 2022.

Numerous microbat species were observed incidentally during nocturnal surveys. Analysis of Anabat data was prepared by Balance Environmental and results have been incorporated into this technical report.

3.5 Pest fauna species

Four terrestrial vertebrate pest species were recorded within the Project area – the Cane Toad (*Rhinella marina*). Rabbit (*Oryctolagus cuniculus*), Common Myna (*Acridotheres tristis*) and Brown Hare (*Lepus europaeus*). Wild Dog (*Canis lupus familiaris*) and Feral Cat (*Felis catus*) are both likely to occur along with a number of introduced bird species. Three of these species (Feral Cat, Rabbit and Wild Dog) are listed as 'restricted matters' under the *Biosecurity Act 2014*.





KEY

- Project area
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Source: EMM (2023); DNRME (2022)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

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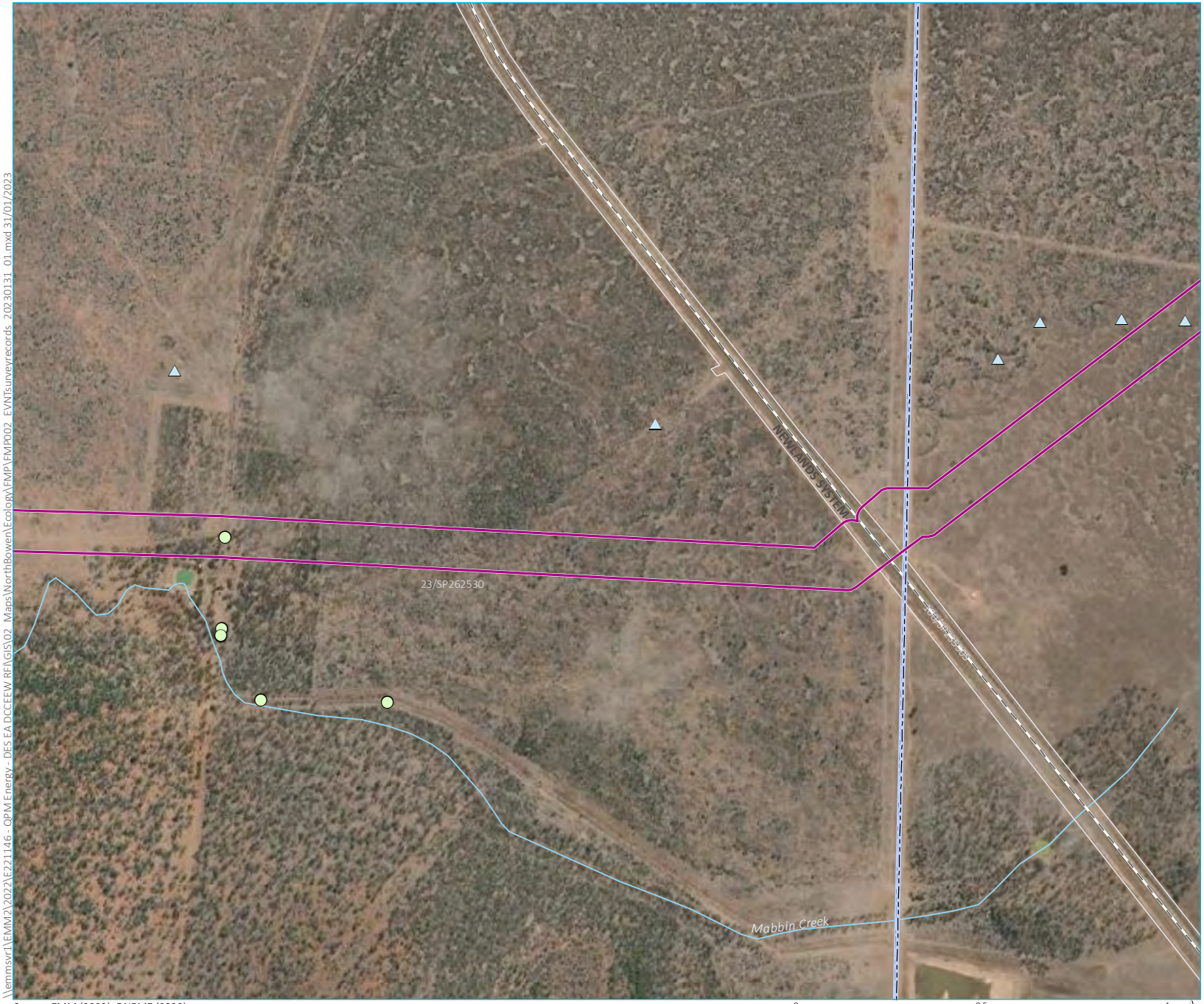
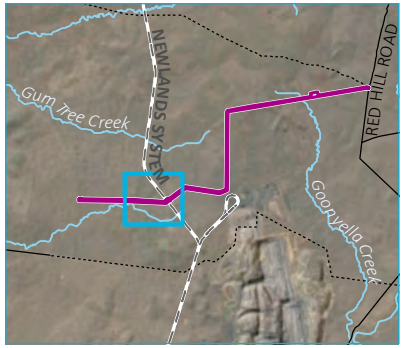
EMM threatened species records within the project area
Map 1 of 6

QPM Energy Project
Fauna Management Plan
Figure 3.1

EMM
creating opportunities





KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Threatened species records (EMM, 2022)

- Ornamental Snake
- Squatter Pigeon

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

EMM threatened species records within the project area
Map 2 of 6

QPM Energy Project
Fauna Management Plan
Figure 3.1

EMM creating opportunities

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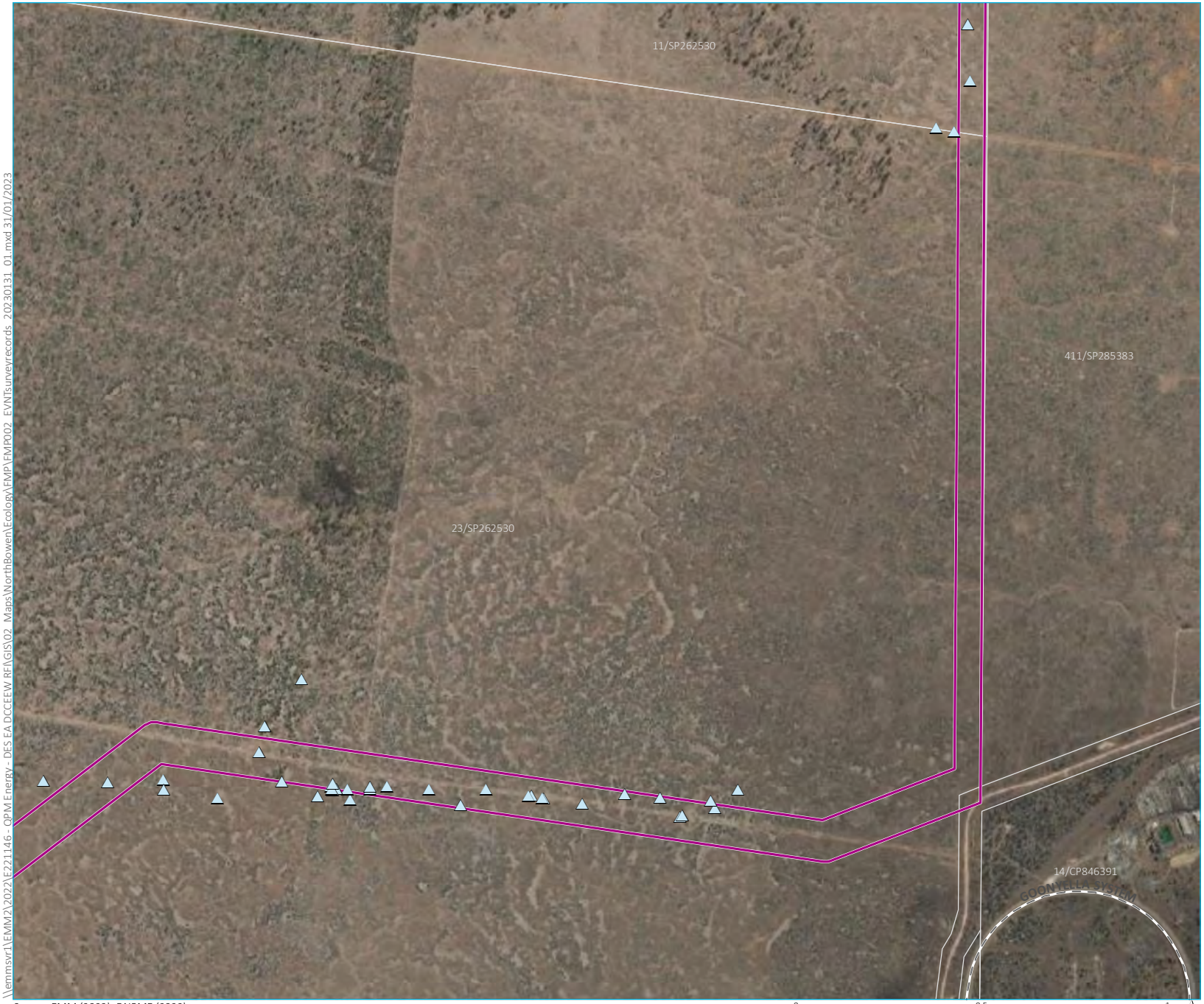

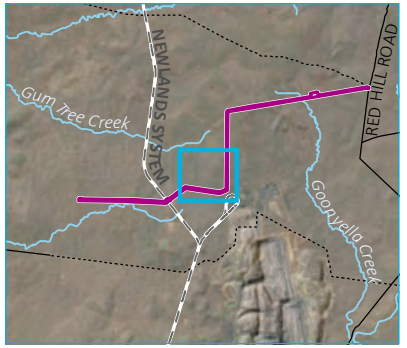

KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Threatened species records (EMM, 2022)

- Ornamental Snake

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\FMP\FMP002 EVNTsurvevrecords 20230131 01.mxd 31/01/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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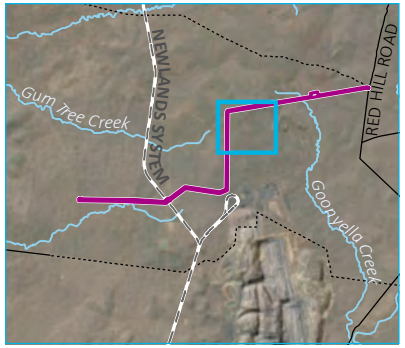
EMM threatened species records within the project area
Map 3 of 6

QPM Energy Project
Fauna Management Plan
Figure 3.1

EMM
creating opportunities



KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Threatened species records (EMM, 2022)

- Ornamental Snake

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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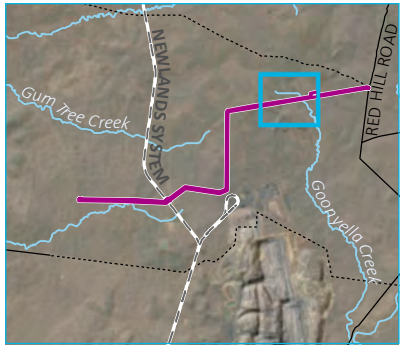
EMM threatened species records within the project area
Map 4 of 6

QPM Energy Project
Fauna Management Plan
Figure 3.1

EMM
creating opportunities



KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

0 0.5 1 km

GDA 1994 MGA Zone 55

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EMM threatened species records within the project area
Map 5 of 6

QPM Energy Project
Fauna Management Plan
Figure 3.1

EMM creating opportunities