Santos

Towrie development (PL1059)

Environmental Protocol for Constraints Planning and Field Development

December 2021

Glossary

Term	Definition
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EMP	Environmental Management Plan
EVNT	Endangered, Vulnerable or Near Threatened species listed under the Queensland *Nature Conservation Act 1992*
GFD	Gas Field Development (GFD) project, an expansion to the GLNG project, approved by the Queensland Coordinator-General under the Queensland *State Development and Public Works Organisation Act 1971* on 3 December 2015 and by the Australian Government under the EPBC Act on 22 March 2016.
GLNG	Gladstone Liquefied Natural Gas (GLNG) project approved by the Queensland Coordinator-General under the Queensland *State Development and Public Works Organisation Act 1971* on 28 May 2010 and by the Australian Government under the EPBC Act on 22 October 2010.
ha	hectares
km	kilometres
Linear infrastructure	Infrastructure including (but not limited to) gas and water gathering lines, low and high pressure gas and water pipelines, roads and tracks, power lines and other service lines.
Low impact petroleum activities	Low impact petroleum activities means petroleum activities which do not result in the clearing of native vegetation, earthworks or excavation work that cause either, a significant disruption to the soil profile or permanent damage to vegetation that cannot be easily rehabilitated immediately after the activity is completed. Examples of such activities include but are not necessarily limited to: • chipholes • coreholes • geophysical surveys • seismic surveys • soil surveys • topographic surveys • cadastral surveys • ecological surveys • installation of environmental monitoring equipment (including surface water).
m	metres
Middle Hill	The elevated, vegetated landform (more than 500 ha) in the south-western part of the tenure.
MNES	Matters of National Environmental Significance, being the relevant matters protected under Part 3 of the EPBC Act.
PL1059	Petroleum Lease 1059
Project Area	The bounds of PL1059
Proposed action	The progressive construction and operation of up to 116 gas wells and associated infrastructure on PL1059. See also 'Towrie development'.
Public Reserve	Land within Lot 12CP864585 (92 ha) located in the north-east of PL1059.
SSMP	Significant Species Management Plan
TEC	Threatened Ecological Community listed under the EPBC Act
Towrie development	The progressive construction and operation of up to 116 gas wells and associated infrastructure on PL1059. See also 'Proposed action'.
Western ridgeline	The elevated, vegetated plateau (more than 1,000 ha) running north/south along the western edge of PL1059.

Santos

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1.0 Introduction

1.1 Background

Santos CSG Pty Ltd (Santos) is proposing to construct and operate up to 116 gas wells, gas and water gathering networks and supporting infrastructure on Petroleum Lease (PL) 1059 in the Arcadia Valley, Queensland (known as the Towrie development).

PL1059 is located approximately 60 kilometres (km) north, north-east of Injune in the Surat/Bowen Basins of eastern Queensland and covers approximately 8,695 hectares (ha). The tenure is immediately west of existing coal seam gas (CSG) wells and infrastructure within the Arcadia gas field authorised as part of the Santos Gladstone Liquefied Natural Gas (GLNG) project and later expansion of that project known as the GLNG Gas Field Development (GFD) project. The tenure, and bounds in which the Towrie development will occur, is henceforth referred to as the Project Area (see Figure 1).

1.2 Purpose

Given there is some uncertainty the extent and quality of the resource across the entirety of the project area, a development footprint for all 116 wells cannot be defined at this time. Instead, development will be staged and the location of project infrastructure will be determined progressively over time as the characteristics and performance of the resource are understood in the context of the development constraints including proximity to existing infrastructure, cultural heritage and landholder considerations and environmental constraints.

This document, the Environmental Protocol for Constraints Planning and Field Development (Environmental Protocol), has been developed to ensure Santos plan and locate proposed infrastructure associated with the Towrie development in strict consideration of relevant Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The relevant MNES include values that have been identified as potential, likely or known occurrences within the Project Area (AECOM, 2021).

The Environmental Protocol will ensure gas field development takes place in accordance with:

- the EPBC Act
- the maximum limits of disturbance established through the MNES assessments (AECOM, 2021) (KCB, 2021) and set down in Section 2.3.1
- project commitments identified in the relevant supporting documentation, including:
    - MNES Ecology Assessment (AECOM, 2021)
    - MNES Water Resources Assessment (KCB, 2021)
    - Chemical Risk Assessment Report (EHS Support, 2021)
    - Environmental Management Plan (EMP) (Santos, 2021a)
    - Significant Species Management Plan (SSMP) (Santos, 2021b).

Using the framework and process detailed in this document, potential impacts on MNES associated with development of any new petroleum activity within the Project Area will be systematically planned, identified, assessed and adequately managed.

The Environmental Protocol will be applied throughout the life of the project for each phase of development including infrastructure planning and design, construction, operation, and decommissioning and rehabilitation. It is most important during planning and design when development activities are sited.

AECOM

0 1 2 KMS

LEGEND

- Project Area (ATP2033)
- Property boundaries
- Roads and tracks
- Major watercourses
- Minor watercourses

Applicable Property Tenure

- Freehold
- Profit à Prendre
- Reserve

FIGURE 1
PROJECT AREA

2.0 Towrie development description

2.1 Proposed activities

The Towrie development includes the progressive construction, operation, decommissioning and rehabilitation of production wells, linear gas and water gathering networks and other supporting infrastructure. The proposed activities will involve the connection of at least one existing exploration well to gas and water gathering infrastructure and production of gas from that well.

Well development will be phased to optimise gas production to meet Santos' gas supply obligations and opportunities. The development will utilise approved capacity of existing gas compression and water treatment facilities located on adjoining tenures. No gas compression facilities or water storages are proposed as part of the proposed development.

The proposed action will involve the progressive development of typical gas field infrastructure components such as:

- well leases (from 1 ha for single well lease and up to 2.5 ha for multi-well lease)
- water and gas gathering lines, trunklines and pipelines (10-25 m wide)
- roads and access tracks (8-15 m wide)
- temporary workers camps (less than 1 ha)
- power and communications lines (co-located with gas gathering lines, trunklines and pipelines)
- other incidental petroleum activities such as borrow pits and laydown areas (less than 1 ha).

Progressive decommissioning and rehabilitation of activities and infrastructure will occur over the life of the tenure reducing disturbance footprints of construction for the duration of operation, until final decommissioning and rehabilitation at end of project life.

2.2 Proposed timing

Construction of the final stage of development is expected to occur from mid-2022. The precise number and timing of wells, and location and configuration of infrastructure components for subsequent stages, will be determined by a range of considerations including ongoing resource exploration, production results and constraints planning undertaken throughout the life of the proposed action.

2.3 Proposed disturbance

The Project Area is predominantly rural land used largely for agricultural development, including cattle grazing and limited cropping. Vegetation and habitat provided by the Project Area varies significantly in quality and extent. The valley floor (central Project Area) is dominated by exotic grassland (predominantly buffel grass) and is generally highly disturbed due to extensive historical clearing, incursion of exotic species including cropping plants and agricultural practices such as blade ploughing and cattle grazing. Three main areas of higher quality vegetation occur: the Public Reserve (lot and plan 12CP864585) in the north-east, the western ridgeline (lot and plans 2TR13, 2SP200046 and 4SP283873) and the large landform approximately 3 km long (Middle Hill, lot and plan 4SP283873).

The proposed development will avoid large areas of remnant, intact and largely undisturbed vegetation present within the western ridgeline, Middle Hill and the Public Reserve. These areas have been avoided as a priority as they contain the greatest extent of threatened ecological communities and high quality habitat for MNES species in the Project Area as detailed in AECOM (2021). The western ridgeline and Middle Hill are at elevations of around 200 metres (m) higher than the valley floor and will be identified as 'no-go' areas to ensure complete avoidance (refer to Section 3.3). The Public Reserve will largely be avoided other than to provide access in the north-east of the tenure for the first phase of development

activities. An access track will be widened and extended along the southern boundary of the reserve in an area already effected by edge effects resulting in reduced vegetation and habitat condition. No wells will be constructed in the Public Reserve.

Disturbance for the development will be limited to discrete well lease areas and linear infrastructure, and restricted to the valley floor of the Project Area. Although this area is dominated by exotic grassland, areas of known or potential MNES habitat do occur and may be directly impacted via vegetation clearing. MNES relevant to the Project Area (i.e. those determined to be potential, likely or known occurrences as per the MNES ecological assessment) include three (3) threatened ecological communities, four (4) threatened flora, 15 threatened fauna species and six (6) migratory fauna species (AECOM, 2021). Direct impacts on potential habitat for the relevant MNES must not exceed maximum disturbance limits discussed in the section below.

2.3.1 Maximum disturbance limits

Maximum disturbance limits for each MNES value are based on conservative habitat mapping (refer to Section 3.1) and the worst case development scenario. Direct disturbance per MNES will not exceed the limits specified in Table 1. The proposed action is not authorised for direct impacts on MNES (listed at the time of referral) not included in Table 1.

Table 1 Maximum disturbance limits for MNES

MNES	EPBC Status	Likelihood of Occurrence	Project Area habitat utilisation	Total potential habitat within Project Area (ha)	Direct impacts permissible	Maximum direct impact (ha)	Percent direct impact (ha)
TEC							
Brigalow	E	Known	-	254.63	**Yes**	2	0.79%
Poplar box	E	Known	-	41.05	**Yes**	0.5	1.22%
SEVT	E	Known	-	534.49	**No**	0	0.00%
Threatened flora							
Acacia grandifolia	V	Potential	-	920.37	**No**	0	0.00%
Bertya opponens	V	Potential	-	1,450.39	**No**	0	0.00%
Ooline	V	Known	-	772.43	**Yes**	5	0.65%
Xerothamnella herbacea	E	Likely	-	250.45	**Yes**	2	0.80%
Threatened birds							
Australian painted snipe	E	Potential	Breeding / nesting	96.12	**No**	0	0.00%
			Foraging or temporary foraging and dispersal	201.12	**Yes**	5	2.49%
Grey falcon	V	Potential	Breeding	41.65	**No**	0	0.00%
			Foraging and dispersal	799.78	**Yes**	13	1.63%
Painted honeyeater	V	Potential	Foraging and dispersal only	411.53	**Yes**	12	2.92%
Red goshawk	V	Potential	Foraging only	1,694.43	**Yes**	2	0.12%

MNES	EPBC Status	Likelihood of Occurrence	Project Area habitat utilisation	Total potential habitat within Project Area (ha)	Direct impacts permissible	Maximum direct impact (ha)	Percent direct impact (ha)
Squatter pigeon (southern)	V	Potential	Dispersal only	2,122.63	**Yes**	13	0.61%
White-throated needletail	V / M	Potential	Roosting and foraging	922.89	**No**	0	0.00%
			Foraging and dispersal	1,199.75	**Yes**	13	1.08%
Threatened mammals							
Greater glider	V	Potential	Breeding / denning	1,002.63	**Yes**	1	0.10%
			Foraging and dispersal	1,004.14	**Yes**		0.00%
Koala	V	Potential	Refuge/ foraging	1,013.1	**Yes**	2	0.20%
			Foraging and dispersal	160.57	**Yes**		0.00%
Large-eared pied bat	V	Known	Breeding / roosting	1,003.87	**No**	0	0.00%
			Foraging and dispersal	864.23	**Yes**	4	0.46%
Northern quoll	E	Potential	Breeding / denning	1,422.67	**No**	0	0.00%
			Foraging and dispersal	206.08	**Yes**	3	1.46%
South-eastern long-eared bat	V	Likely	Roosting / foraging	1,223.60	**Yes**	4	0.33%
			Foraging and dispersal	644.5	**Yes**		0.00%
Threatened reptiles							
Adorned delma	V	Potential	Breeding and foraging	920.37	**Yes**	1	0.11%
Dunmall's snake	V	Likely	Breeding and foraging	1,216.43	**Yes**	2	0.16%
Ornamental snake	V	Potential	Breeding and foraging	257.71	**Yes**	2	0.78%
Yakka skink	V	Potential	Breeding and foraging	1,104.89	**Yes**	2	0.18%
Migratory birds							
Fork-tailed swift	M	Potential	Foraging and dispersal	2,122.63	**Yes**	13	0.61%
Glossy ibis	M	Known	Foraging and dispersal	164.0	**Yes**	1	0.61%
Latham's snipe	M	Potential	Foraging and dispersal	164.0	**Yes**	1	0.61%
Oriental cuckoo	M	Potential	Foraging and dispersal	1,015.19	**Yes**	13	1.28%
Rufous fantail	M	Likely	Breeding, foraging and dispersal	536.60	**No**	0	0.00%

MNES	EPBC Status	Likelihood of Occurrence	Project Area habitat utilisation	Total potential habitat within Project Area (ha)	Direct impacts permissible	Maximum direct impact (ha)	Percent direct impact (ha)
			Foraging and dispersal	1,350.17	**Yes**	13*	0.96%
Satin flycatcher	M	Potential	Foraging and dispersal	1,015.19	**Yes**	13*	1.28%

* Not within habitat that meets area threshold for nationally important habitat as per Referrable Guideline for 14 listed migratory species under the EPBC Act

3.0 Constraints framework

The constraints framework described in this document is based on the hierarchy of management principles to avoid, minimise and manage land disturbance and impacts on MNES when planning for and implementing new petroleum activities within the Project Area:

1. Avoid – avoiding direct and indirect adverse environmental impacts where practicable
2. Minimise – minimise direct and indirect adverse environmental impacts where these cannot be avoided
3. Mitigate – implement mitigation and management measures to minimise direct, indirect and cumulative adverse impacts
4. Remediate and rehabilitate – actively remediate and rehabilitate impacted areas to promote and maintain long-term recovery
5. Offset (only where required) – provide suitable offsets for activities that result in significant residual impacts to MNES even with the implementation of the above principles.

The following sections describe the key components of the constraints framework and how they have been utilised in the planning of development to ensure minimal impact to MNES. These key components include the MNES habitat and constraints mapping. Whilst these have initially been used in early planning stages, such as the development of maximum disturbance limits, they will also be integral to the implementation of the constraints framework during the Project's detailed infrastructure design and siting stage as further described in Section 4.0.

3.1 MNES habitat mapping

MNES habitat mapping for the Project Area forms the basis of the constraints mapping and includes all potential habitat for all MNES identified as known, likely or potentially occurring within the Project Area. It was developed by applying the ecological field validation data and LiDAR results to habitat definitions that were formulated for each of the relevant MNES utilising the relevant guidance (AECOM, 2021). This included but was not limited to, the Department's Species Profile and Threats Database (SPRAT) (DAWE, 2021), conservation advice and recovery plans. Further detail on the habitat definitions are provided in Appendix A.

Where ecological field validation surveys have occurred within the Project Area, there is high confidence in the habitat mapping. As such, habitat mapping should be treated as the point of truth and may only be altered following further detailed ecological assessment by a suitability qualified ecologist as described further in Section 4.0. Notwithstanding, the maximum disturbance limits for MNES values stated in Section 2.3.1 of this Protocol are set and cannot be increased.

Two (2) threatened ecological communities and eight (8) threatened species were found unlikely to occur within the proposed action area based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present within the proposed action area, field records and the proximity of publicly available records. Although assessed as unlikely to occur, it is noted that there is less confidence in the habitat mapping within lot and plan 2SP200046 due to the lack of field validated data. In the rare event that these values do in fact occur within lot and plan 2SP200046 habitat descriptions have been provided in Appendix A to ensure appropriate investigations are completed during the detailed ecological assessment. Habitat descriptions are also available in the in the SSMP (Santos, 2021b).

3.2 Constraints mapping

Constraints mapping includes environmental and land use layers, as well as administrative boundaries and existing infrastructure. The mapping of vegetation communities, habitat types and associated MNES

values across the Project Area however form the primary constraints data source for the model (habitat mapping, described above). The constraints mapping has designated areas within the Project Area into five categories to control what infrastructure and activities are permitted to protect inherent values and risks, including:

- No-go area
- High constraint area
- Moderate constraint area
- Low constraint area
- Special purpose e.g. farm dams.

Detailed ecological assessments have been completed across most of the valley floor where infrastructure will occur within the Project Area, except for lot and plan 2SP200046 in the south. As there is less certainty in the habitat mapping for this area and therefore associated constraints mapping and categorisation, detailed ecological assessments will be completed for lot and plan 2SP200046 in accordance with Section 4.2 before any disturbance can occur in that location.

There are a number of other constraints relevant to the Project that fall outside the scope of this Protocol that must be considered when planning field development activities. These include considerations such as landholder agreements, presence of sensitive receptors and constructability restrictions as well as those prescribed through other legislative mechanisms including Matters of State Environmental Significance (MSES), cultural heritage requirements, land use and tenure based constraints. These constraints influence development differently, from outright exclusion to preferential avoidance. Santos will balance development needs against all constraints (including MNES), ensuring firstly, that activities are compliant with legal obligations including those imposed by a decision on the proposed action under the EPBC Act. Notwithstanding, Santos will preferentially locate infrastructure in the lowest ranked constraint category.

Santos utilise a geographic information system (GIS) model that will identify the locations of values identified in constraints mapping. The constraints mapping layer will be maintained in this database, or, where data is not directly collected into the Santos GIS database, the information will be supplied to Santos GIS department with confidence or resolution detail to maintain the layer integrity.

3.3 Constraints planning

Table 2 below provides a summary of the permitted development activities that have been planned within each constraint category area given the MNES values and quality of habitat that has been identified to be potential present.

The subsequent sections further describe the areas designated within each category and how development activities are to occur in relation to the management of MNES values.

Table 2 Summary of activities permitted in each constraint category for the Towrie Project

Constraint category	Low impact petroleum activities	Linear infrastructure	All petroleum activities	Water extraction for construction purposes
No-go area	No	No	No	No
High constraint area	Yes	Yes	No	No
Moderate constraint area	Yes	Yes	Yes	No

Constraint category	Low impact petroleum activities	Linear infrastructure	All petroleum activities	Water extraction for construction purposes
Low constraint area	Yes	Yes	Yes	No
Dams	No	No	No	Yes

[1] Definitions are included in the glossary.
[2] All petroleum activities will be permitted within the moderate constraints area, however, disturbance will be minimised in accordance with the Protocol and will not exceed upper disturbance limits identified in Table 3.
[3] Habitat for MNES is described in Appendix A consistent with MNES Ecology Assessment (AECOM 2021a) and Significant Species Management Plan (AECOM 2021b).

3.3.1 No-go area

No-go areas are recognised for providing contiguous high quality areas of MNES habitat. No-go areas apply to:

- Western ridgeline i.e. the elevated, vegetated plateau (more than 1,000 ha) running north/south along the western edge of the Project Area
- Middle Hill i.e. the elevated, vegetated landform (more than 500 ha) in the south-western part of the tenure
- Threatened ecological communities (TECs) except
    - Brigalow (dominant or co-dominant) TEC
    - Poplar Box Grassy Woodland on Alluvial Plains TEC.

Avoidance and mitigation measures

- All petroleum activities are strictly prohibited within No-go areas.

3.3.2 High constraint area

High constraint areas contain high value habitats comprising remnant and advanced regrowth vegetation vulnerable to habitat fragmentation. High constraint areas apply to:

- Public Reserve i.e. land within Lot 12CP864585 (92 ha) containing multiple MNES values located in the north-east of PL1059
- Brigalow (dominant or co-dominant) TEC
- Poplar Box Grassy Woodland on Alluvial Plains TEC
- MNES habitat, including remnant and advanced regrowth vegetation, along mapped watercourses.

Avoidance and mitigation measures

- Only low impact petroleum and linear infrastructure are permitted within this constraint area.
- Draft refinements to the design will be made if possible to avoid habitat features as detailed in Section 4.1.3
- Impacts to the Public Reserve will be restricted to the edges, as required to provide access route.
- Infrastructure siting will preferentially maximise the use of existing gaps. Where clearing is required in an area comprising narrow linear patches, clearing will not result in gaps between patches greater than 100 m which would be impassable for some MNES fauna such as the greater glider.
- Disturbance will be minimised and cumulative disturbance will not exceed the maximum limits identified in Table 1.

- Implementation of mitigation measures and monitoring described in the EMP.

3.3.3 Moderate constraint area

Moderate constraint areas contain remaining mapped MNES habitat values, largely represented by narrow linear and disconnected vegetation and the margins of the constructed wetland.

Avoidance and mitigation measures

- While all petroleum activities are permitted within this constraint area, disturbance will be limited to the extent of the proposed activities described in Section 2.0.
- Draft refinements to the design will be made if possible to avoid habitat features as detailed in Section 4.1.3.
- Infrastructure siting will preferentially maximise the use of existing gaps. Where clearing is required in an area comprising narrow linear patches, clearing will not result in gaps between patches greater than 100 m which would be impassable for some MNES fauna such as the greater glider.
- Disturbance will be minimised and cumulative disturbance will not exceed the maximum limits identified in Table 1.
- Field scout process (see Section 4.1.3) will be strictly followed to ensure any differences between on-ground conditions and constraints mapping are managed appropriately.
- Implementation of mitigation measures and monitoring described in the EMP.

3.3.4 Low constraint area

Low constraint areas contain cleared/ploughed exotic pastures used for agriculture and other sparse non-remnant vegetation. Low constraint areas apply to:

- Remaining areas validated as unlikely to support a MNES population or suitable habitat
- Existing Santos infrastructure
- Existing roads and other infrastructure.

Avoidance and mitigation measures

- All petroleum activities are permitted within this constraint area to the extent of the proposed activities described in Section 2.0
- Field scout process (see Section 4.1.3) will be strictly followed to ensure any differences between on-ground conditions and constraints mapping are managed appropriately.
- Implementation of mitigation measures and monitoring described in the EMP.

One MNES value known to occur within the Project Area, *Cadellia pentastylis*, has been recorded as single individuals within areas dominated by exotic pasture. While known and potential locations of this value have been captured in as much detail as possible in the habitat mapping, it must be acknowledged that this value may occur in areas currently considered a low constraint. Although direct impacts on *Cadellia pentastylis* are permissible up to the maximum disturbance limit (see Table 1), all direct impacts must be recorded. Section 4.1.3 details the measures in place that will ensure no unintentional impacts to *Cadellia pentastylis* occur.

3.3.5 Dams and constructed wetlands

Dams and constructed wetlands include waterbodies within the Project Area used for agricultural water supply where Santos may extract and use water where lawful and permitted by landholder for construction of the Towrie development.

Avoidance and mitigation measures

- Extraction from waterbodies will only occur where lawful and permitted by landholder.
- A single access point will be used per waterbody.
- The Project will be undertaken in stages, limiting the extent of extraction from the constructed wetland at any one time and will only be used to support activities on the property the constructed wetland occurs within.
- As development progresses across the Project Area, extraction will be redirected to nearby waterbodies to minimise impacts at a single location, subject to landholder requests.
- Implementation of mitigation measures and monitoring described in the EMP.

4.0 Implementation of the Protocol

The Protocol will be implemented through Santos' internal development planning, assessment and approval process, known as Integrated Development Planning (IDP). The IDP process aims to ensure Santos' activities are designed and executed in compliance with relevant State and Federal legislation, regulatory approvals, authorities and other permits, and takes into account environmental, social and other constraints.

The IDP process is carried out for all new field development and land disturbance activities during the infrastructure planning and design stage (pre-disturbance) and includes the steps shown in Figure 2. This process will be applied for every development phase on the Towrie development and is key to the avoidance of MNES values for the duration of the proposed action. Each of these steps is described further in the sections below.

Notwithstanding the steps identified in Figure 2, a detailed ecological assessment will occur within lot and plan 2SP200046 due to the current lack of field validated data in this location.

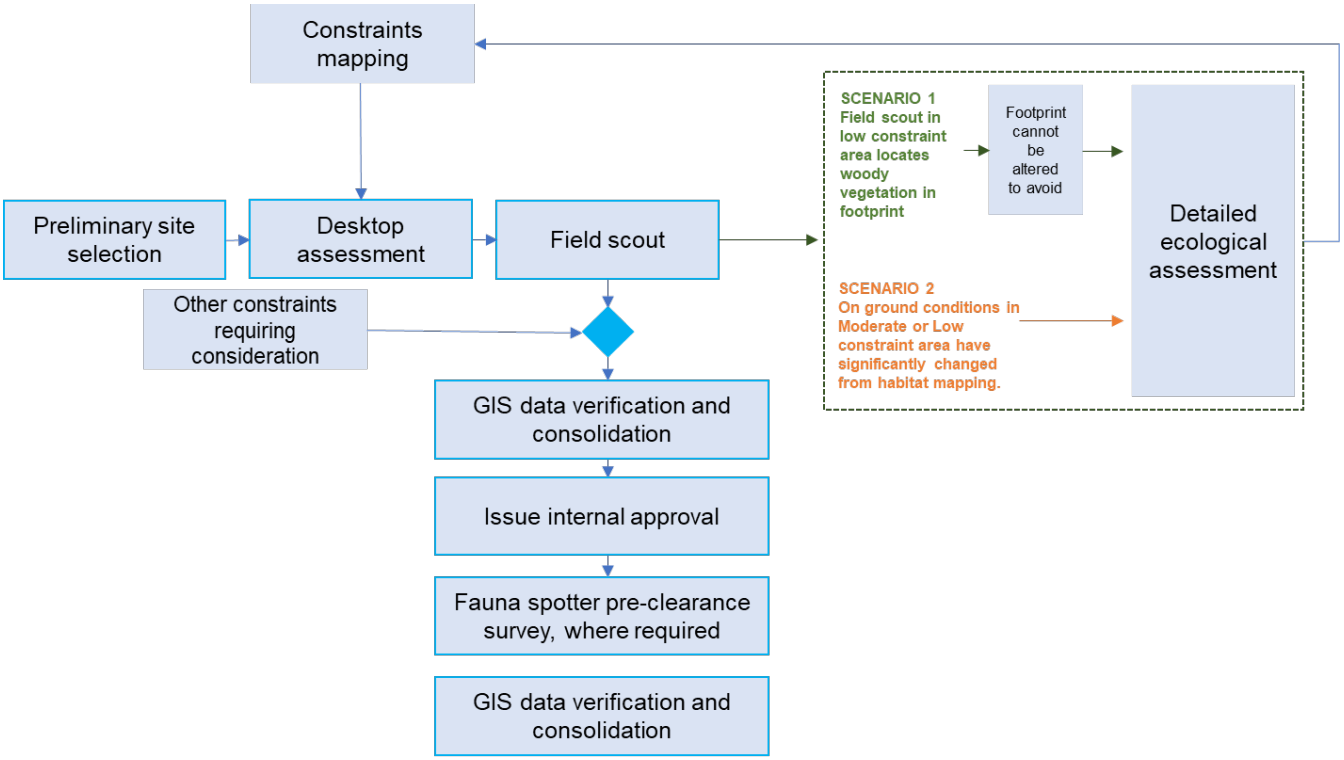

Figure 2 Implementation of the Protocol through the Integrated Development Planning process

4.1 Infrastructure planning and design (pre-disturbance)

The Protocol will predominantly be applied during the planning and design phases that determine the locations of wells and infrastructure and extent of disturbance. The key steps in this phase are outlined in the sections below.

4.1.1 Preliminary site selection

Santos' disturbance initiation process starts with the determination of the area subject to internal approval. The internal approval area determination can be for a large-scale program or for smaller discrete work packages.

Initial well locations, as well as the number and configuration of wells, are identified based on sub-surface targets, and knowledge of and demand for the resource. Preliminary gas and water gathering lines are designed to link wells to connector or transmission pipelines.

4.1.2 Desktop assessment

Preliminary well locations and linear infrastructure designs are assessed using available desktop information by a multi-disciplinary team. The team typically includes representatives from GIS, environment, cultural heritage, land access, geology/subsurface, engineering and project management teams. The desktop assessment involves:

- identifying the appropriate external approvals and regulatory permits that the activities must be assessed against
- assessing the preliminary well locations and linear infrastructure designs against mapped constraints in the GIS, high resolution aerial imagery and the Protocol
- refining well locations and linear infrastructure to ensure compliance with the Protocol and minimise impacts on known constraints, including mapped MNES
- identifying potential access points.

Opportunities to further reduce impacts to MNES will be maximised during the desktop phase by prioritising avoidance for more sensitive MNES values (based on threat status), identified in the constraints mapping. When refining well locations and linear infrastructure the following ecological prioritisation for avoidance outlined in Table 3 will be consulted.

The output of the desktop assessment will be the concept infrastructure (desktop) IDP layer and will be available in the Santos GIS.

Table 3 Ecological avoidance in order of priority

Priority	Ecological value or attribute	Ranking (highest to lowest)	Status
1	TEC by listing status	1	EPBC Act Endangered
2	Threatened flora by listing status	1	EPBC Act Endangered
		2	EPBC Act Vulnerable
3	Mapped threatened fauna habitat by listing status	1	EPBCT Act Critically Endangered
		2	EPBC Act Endangered
		3	EPBC Act Vulnerable

4.1.3 Field scout

Following the desktop assessment, Santos representatives carry out a field scout of the concept infrastructure (desktop) IDP layer. The landowner may also accompany the field scout. This is where reasonableness and constructability considerations of the desktop locations are tested in the field.

During the field scout, site conditions are recorded including any environmental constraints, such as the locations of woody vegetation and habitat features (such as large fallen logs) and existing infrastructure. Draft refinements to the design will be made if possible to avoid woody vegetation within low constraint areas. If this cannot be done and woody vegetation is to be impacted in low constraint areas, an ecological assessment undertaken by a qualified ecologist will be required to confirm if the area supports MNES values. The focus of this assessment is to determine if impacts need to be considered as part of the Project's maximum disturbance limits. The ecological assessment needs to be in accordance with the approach in Section 4.2 and habitat definitions in Appendix A.

Draft refinements to the design will be made if possible to avoid habitat features within moderate and high constraint areas in the following order of priority:

1. Hollow-bearing trees and large hollow logs
2. Koala food trees
3. Mistletoe
4. Gilgai
5. Termite mounds and raptor nests
6. Other such as decorticating bark and rock piles

If the field scout identifies on-ground conditions that are significantly different to the low or moderate constraint mapping, and infrastructure is proposed to be sited in this location, a detailed ecological assessment undertaken by a qualified ecologist will be required to confirm the on-ground conditions. The focus of this assessment is to determine if the area still supports MNES values and if impacts need to be considered as part of the Project's maximum disturbance limits. The ecological assessment needs to be in accordance with the approach in Section 4.2 and habitat definitions in Appendix A..

If present, the landholder will be consulted on the proposed layout and site access, and any requests to reduce impacts to property operations or infrastructure.

Outputs of the field scout will be the concept infrastructure (scouted) IDP layer, which will be available in the Santos GIS. An environmental advisor reviews the outputs of the field scout.

4.1.4 GIS data verification and consolidation

Following completion of the field scout and any detailed ecological assessment, the field validated values and any refinements made to the design/layout are uploaded into the GIS. Where the results of the detailed ecological assessment are significant, Santos may be required to repeat desktop assessment of infrastructure locations to refine and minimise proposed impacts to identified MNES values and comply with maximum disturbance limits.

4.1.5 Issue internal approval

After design refinements based on field scouting and ecological assessments are complete, the final design/layout of the proposed activity is issued to the business for internal approval. The internal approval will identify the authorised activities under the approval, extent and limits of disturbance permitted for those activities, any environmental exclusion zones and environmental mitigations required. Once the internal approval has been granted, development activities can proceed subject to requirements of the internal approval.

4.1.6 Fauna spotter pre-clearance survey

For development that receives internal approval in any areas containing woody vegetation, a pre-clearance survey will be undertaken by a qualified fauna spotter catcher. Pre-clearance surveys are to be undertaken just prior to clearing activities. The fauna spotter catcher will also be present and supervise all clearing works.

4.2 Detailed Ecological Assessments

Ecological field assessments have been conducted across the majority of the Project Area and informed habitat mapping detailed in Section 3.1. As detailed in the MNES assessment (AECOM, 2021), survey methodology and effort reflected the Department's survey guidance for each MNES as far as practical or possible given other constraints such as Project Area size, land access and seasonality.

Ecological field assessments on lot and plan 2SP200046 have not yet been conducted due to land access restrictions. However, as detailed in Section 3.2, a detailed ecological assessment will be completed prior to project development commencing in this area. To ensure consistency in the methodology utilised and confidence in the accuracy of findings, any future detailed ecological assessments will be completed by a suitably qualified ecologist in accordance with the methods provided in Appendix B.

Any additional detailed ecological assessments completed within the Project Area will:

- take into account and reference previous ecological surveys undertaken in the area and relevant new information on the likely presence or absence of MNES
- document the survey methodology, results and significant findings in relation to MNES
- identified MNES habitat as per the descriptions provided in Appendix A
- be undertaken by a suitably qualified ecologist.

Habitat definitions for known, likely or potentially occurring MNES as outlined in Appendix A form the basis for future MNES habitat mapping and constraints categorisation following the results of the detailed ecological assessment survey. In the rare event that MNES values previously identified as unlikely are in fact identified during detailed ecological assessments within lot and plan 2SP200046, future MNES habitat mapping and constraints categorisation is to be in accordance with the habitat descriptions in Appendix A and the SSMP (Santos, 2021b).

The findings of the detailed ecological assessments will be reflected in updated MNES and constraints mapping (see Section 4.1.4) as well as this Protocol and other supporting documents if necessary.

4.3 Post-disturbance requirements

4.3.1 Recording and tracking disturbances

The assessment of the actual extent of disturbance to MNES will be recorded along with the cumulative extent of disturbance relative to the maximum disturbance limits (Table 1). Where disturbance to MNES values is required, the following details will be recorded:

- location and type of infrastructure or activity
- internal approval and site environmental plan
- environmental constraints disturbed
- extent of disturbance and the relevant effect on the disturbance limits in Table 1.

The information will be recorded and maintained so that it can be audited. Disturbance data will be regularly updated in GIS to allow tracking of cumulative disturbances against the maximum disturbance limits.

4.3.2 Data collection and storage

Santos will maintain accurate records, survey information, photographs, field data or any material associated with the field validation requirements to demonstrate that surveys and environmental assessments were conducted in a manner consistent with this protocol.

The results of the detailed environmental assessment will be documented and records maintained.

5.0 References

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Appendix A Habitat descriptions

Table A1 Habitat descriptions for EPBC Act listed species and communities

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
Threatened Ecological Communities				
Brigalow *(Acacia harpophylla* dominant and co-dominant*)* (Brigalow)	E	The Brigalow *(Acacia harpophylla* dominant and co-dominant*)* ecological community (Brigalow TEC) is characterised by either the dominance or codominance of *Acacia harpophylla* (Brigalow) as a canopy or sub-canopy species. Other canopy species that may be associated with this TEC include *Casuarina cristata* (Belah), other Acacia species and/or Eucalypt species. Structurally, the community may exist in a variety of forms from low open woodlands to open forests with dominant tree layers ranging between 9 m in height (in low rainfall regions) through to 25 m in height (in higher rainfall areas). The Commonwealth Listing Advice on Brigalow *(Acacia harpophylla* dominant and co-dominant*)* ecological community (Threatened Species Scientific Committee, 2001) details the diagnostic and condition thresholds that must be met for an area to be considered Brigalow TEC.	Remnant and HVR vegetation communities 0.5 ha in size or greater, associated with any of the following Brigalow Belt bioregion REs: 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14, 11.12.21	-
Poplar box grassy woodlands on alluvial plains (Poplar box)	E	The Poplar Box Grassy Woodland on Alluvial Plains ecological community (Poplar Box TEC) occurs as an open woodland to woodland with an understorey mostly of grasses and other herbs. It may include a low density of shrubs, however patches of the ecological community generally lack a substantial mid layer (tall shrub). While Poplar box (*Eucalyptus populnea*) must dominate the canopy, other tree species may also occur in this layer including: *Acacia harpophylla* (brigalow), *Callitris glaucophylla* (White Cypress Pine), *Casuarina cristata* (belah), *Eucalyptus coolabah* (Coolibah), *E. largiflorens* (Black Box), *E. melanophloia* (Silver-leaved Ironbark) and *Melaleuca bracteata*. Canopy height is up to 20 m. The Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains (Department of the Environment and	Remnant communities associated with the following Brigalow Belt bioregion REs: 11.3.2, 11.3.17, 11.4.7, 11.4.12.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Energy, 2019) details the diagnostic and condition thresholds that must be met for an area to be considered Poplar Box TEC.		
Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar bioregions (SEVT)	E	The Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions ecological community (SEVT TEC) is also known as softwood scrub or bottle tree scrub. This TEC is characterised by a floristically diverse and heterogeneous assemblage of species, especially in the canopy and shrub layers. Typically, one patch of SEVT may contain over 40 vascular plant species, although the number of tree species is highly variable, ranging from 1 to 19 species. Emergent species are composed of a range of evergreen, semi-evergreen and deciduous species, including *Brachychiton rupestris* (Narrow-leaved bottle tree) which is generally present within all SEVT areas. Other species that may be locally present as emergent include *Acacia harpophylla* (Brigalow), *Brachychiton australis* (Broad-leaved bottle tree) and *Casuarina cristata* (Belah), or less often *Acacia fasciculifera*, *Archidendropsis thozetiana* (Grey Boxwood), *Cadellia pentastylis* (Ooline), *Euroschinus falcata*, *Flindersia australis* (Crow's ash) and *Ventilago viminalis* (Vine tree). A wide range of species are generally present within the canopy stratum and generally include *Backhousia angustifolia*, *Backhousia kingii*, *Croton insularis*, *Denhamia oleaster*, *Ehretia membranifolia*, *Geijera parviflora*, *Macropteranthes leichhardtii*, *Notelaea microcarpa* and *Pouteria cotinifolia*. A dense shrub understorey may be present. However where the canopy is very dense, shrubs may be absent as a result of competitive exclusion. Species common in the shrub layer include *Acalypha eremorum*, *Alectryon diversifolius*, *Everistia vacciniifolia*, *Carissa ovata*, *Croton phebalioides*, *Exocarpos latifolius*, *Geijera parviflora*, *Pittosporum spinescens* and *Triflorensia ixoroides*.	Remnant and HVR vegetation communities associated with any of the following Brigalow Belt bioregion REs: 11.2.3, 11.3.11, 11.4.1, 11.5.15, 11.8.3, 11.8.6, 11.8.13, 11.9.4, 11.9.8, 11.11.18.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		The Commonwealth Listing Advice on Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (Threatened Species Scientific Committee, 2001) details the diagnostic criteria that must be met for an area to be considered SEVT TEC.		
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions		The Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions ecological community (Coolibah TEC) is associated with the floodplains and drainage areas of the Darling Riverine Plains and the Brigalow Belt South IBRA bioregions. This ecological community represents occurrences of one type of eucalypt woodland where *Eucalyptus coolabah subsp. coolabah* (Coolibah) and/or *Eucalyptus largiflorens* (Black Box) are the dominant canopy species and where the understorey tends to be grassy. The Coolibah – Black Box Woodlands are found on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands, and stream levees (NSW Scientific Committee, 2009). The landscape is flat to low relief where small changes in slope and height can influence the species composition. Parts of the ecological community associated with drainage depressions, or areas of lower floodplain remain inundated for longer periods than parts of the ecological community associated with higher floodplain areas of the distribution. Coolibah – Black Box Woodlands are found in a climatic zone that has summer dominant rainfall with an average annual rainfall ranging from approximately 250 to 700 mm per year. Average minimum monthly temperatures range from -2°C to 5°C and average maximum monthly temperatures range from 23°C to 35°C. The Commonwealth Listing Advice on Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Threatened Species Scientific Committee, 2011) details the diagnostic and	Remnant communities associated with the following Brigalow Belt bioregion REs: 11.3.3, 11.3.15, 11.3.16, 11.3.28, 11.3.37.	This TEC is considered an unlikely occurrence within the Project Area and was not recorded in previous surveys conducted.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		condition thresholds that must be met for an area to be considered Coolibah TEC.		
Threatened flora species				
Acacia grandifolia	V	The species grows on hilly terrain of varying aspects and slope, on hillcrests, in gullies on plains. The species appears to flourish in disturbed ground and grows well on roadsides. At the type locality the species forms open stands on sand, among large sandstone boulders. It has also been recorded on shallow stony soils derived from basalt. It occurs in ironbark gum and spotted gum forests and woodlands. The most frequently recorded associated tree species are *Eucalyptus crebra, Corymbia citriodora, Corymbia trachyphloia* and *Eucalyptus exserta*.	Ironbark gum and spotted gum forests and woodlands on hilly terrain associated with land zone 9, 10, 11 and 12.	-
Arthraxon hispidus Hairy-joint grass	V	In NSW and Queensland, *Arthraxon hispidus* is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps, as well as woodland. In south-east Queensland, *Arthraxon hispidus* has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks and on sandy alluvium in creek beds in open forests and also with bog mosses in mound springs (Threatened Species Scientific Committee, 2008).	-	This species is considered an unlikely occurrence within the Project Area due to the lack of records in the wider area.
Cadellia pentastylis Ooline	V	Ooline occurs in a range of vegetation types, and often associates with *Acacia harpophylla* (Brigalow), *Casuarina cristata* (Belah), *Acacia catenulata* (Bendee) and *Lysiphyllum carronii* (Red bauhinia) species in dry rainforest, semi-evergreen vine thicket and sclerophyll communities. *Cadellia pentastylis* may be observed as the locally dominant species within such communities.	Semi-evergreen vine thicket (SEVT) and brigalow communities including brigalow with softwood scrub understorey (i.e. RE 11.9.5a).	This species has been recorded within the Project Area as single individuals surrounded by exotic pasture.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		This species is found on clay plains, sandstone slopes, and ridgelines between 200 and 500 m above sea level, often on the moderately fertile soils preferred for agriculture and pasture development.		
Bertya opponens	V	The known populations of *Bertya opponens* within New South Wales occur in a number of different habitats, ranging from stony mallee ridges and cypress pine forests of the inland, to cliff edges in the high rainfall eastern fall areas of the Great Dividing Range. The wide variation in habitat type between the populations makes the identification of critical habitat very difficult. In Queensland, the species has been identified on the crest of a sandstone massif in a dense thicket (circa 4 m high) in association with *Alstonia constricta, Alphitonia excelsa, Erythroxylum sp., Jasminum simplicifolium* and *Bursaria spinosa* with scattered *Callitris glaucophylla, Callitris endlicheri* and *Eucalyptus crebra* on sandy loam (Atlas of Living Australia 2014). The species has also been identified in *Acacia shirleyi* woodland on a steep sandstone ridge with sandy substrate associated with scattered *Eucalyptus decorticans* with a grassy ground layer dominated by *Cleistochloa sp*. At Baffle Creek, the species was identified in open woodland amongst sandstone boulders between the base of the cliffline and the north side of creek in heavy shade.	Mixed shrubland, lancewood woodland, mallee woodland, Eucalyptus/Acacia open forest with shrubby understorey, Eucalyptus/Callitris open woodland and SEVT on land zones 7, 9, 10, 11 and 12.	-
Dichanthium setosum	V	This species is associated with heavy basaltic black soils and stony red-brown loam with clay subsoil and has been observed in moderately disturbed areas such as cleared woodland, grass roadside remnants, grazed land and highly disturbed pastures.	-	Both RE and geology mapping indicates that basaltic soils do not occur within the Project Area. This species is considered an unlikely

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
				occurrence within the Project Area and has not been recorded during previous surveys.
Thesium austral	V	*Thesium australe* is semi-parasitic on roots of a range of grass species, notably Kangaroo grass (*Themeda triandra*) (Scarlett et al 1994). It occurs in subtropical, temperate and subalpine climates over a wide range of altitudes. It occurs on soils derived from sedimentary, igneous and metamorphic geology on a range of soils including black clay loams to yellow podzolics and peaty loams (Leigh & Briggs 1984; Hunter et al 1999; Cohn 2004). It occurs in shrubland, grassland or woodland, often on damp sites (George 1984; Harden 1992). Vegetation types include open grassy heath dominated by Swamp myrtle (*Leptospermum myrtifolium*), Small-fruit hakea (*Hakea microcarpa*), Alpine bottlebrush (*Callistemon sieberi*), Woolly grevillea (*Grevillea lanigera*), Coral heath (*Epacris microphylla*) and *Poa spp.* (Griffith 1991); Kangaroo grass grassland surrounded by Eucalyptus woodland; and grassland dominated by Barbed-wire grass (*Cymbopogon refractus*).	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys.
Tylophora linearis	E	*Tylophora linearis* grows in dry scrub, open forest and woodlands associated with *Melaleuca uncinata, Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla, Allocasuarina luehmannii, Acacia hakeoides, Acacia lineata, Myoporum spp. and Casuarina spp.* (NSW OEH 2014; Forster et al 2004). This species occurs within the Border Rivers–Gwydir, Central West, Namoi (NSW), and Border Rivers Maranoa–Balonne (Queensland) Natural Resource Management regions.	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
Xerothamnella herbacea	E	*Xerothamnella herbacea* occurs in Brigalow (*Acacia harpophylla*) dominated communities in shaded situations, often in leaf litter and is associated with gilgais (shallow ground depressions; refer to section 2.4.1). Soils are heavy, grey to dark brown clays. The preferred habitat of *Xerothamnella herbacea* at Gratz Gully appeared to be: • Floodplain flats, channel banks and beds, no greater than 0.5 m elevation above the channel; usually within 50 cm elevation of the top of the ditch/channel ie mounds, low ridges and rises between drainage ditches, gutters, rills and channels, and flood ponds • Soils with high clay content • Shade of greater than 40% • Shade provided by Brigalow (Acacia harpophylla) and Wilga (Geijera parviflora) most often, and Poplar box (Eucalyptus populnea) to a lesser degree (more often on the southern side of small shade patches) • Areas of notable leaf litter coverage • Sometimes associated with gilgais (shallow ground depressions; refer to section 2.4.1). Associated herbaceous species most frequently detected with *Xerothamnella herbacea* included Blue trumpet (*Brunoniella australis*), Slender sedge (*Cyperus gracilis*), Curly windmill grass (*Enteropogon ramosus*), Creeping shade grass (*Oplismenus aemulus*) and Pink tongues (*Rostellularia adscendens*).	Brigalow dominated communities and gilgai on heavy clay soils.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Xerothamnella herbacea plants look similar to *Brunoniella australis* and *Rostellularia adscendens*, two very common forbs throughout the search area. *Xerothamnella herbacea* plants are distinguishable from a distance by a neater, more symmetrical leaf arrangement, more glabrous (smooth or hairless) foliage and stems, lighter and more consistent shade of green, a thinner more delicate appearance to leaves, fruit spade shaped (*Brunoniella australis* fruit rod shaped), flowers arising together in heads, corolla with distinct upper petals (*Rostellularia adscendens* upper petals absent or not obvious, flowers arranged along spikes 2 to 7 cm long).		
Threatened and/or Migratory birds				
Curlew sandpiper (*Calidris ferruginea*)	CE	Curlew sandpiper mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are recorded less often inland including around ephemeral and permanent lakes, dams, waterholes and bore drains. The species occurs in both fresh and brackish waters (Higgins & Davies 1996). The species forages on mudflats and nearby shallow water. In non-tidal wetlands they usually wade in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beachcast seagrass or seaweed. They rarely forage on exposed reefs (Higgins & Davies 1996). Curlew sandpipers roost in open situations with damp substrate, especially on bare shingle, shell or sand beaches, sandspits and islets in or around	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys. This species is primarily coastal, and the Project Area is approximately 250 km inland.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		coastal or near-coastal lagoons and other wetlands. The occasionally roost in dunes during very high tides and in saltmarsh (Higgins & Davies, 1996).		
Fork-tailed swift *(Apus pacificus)*	M	This species is usually observed flying over open country (from semi-arid to coastal zones and islands), however occasionally observed flying over forests and cities. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The species sometimes occurs above rainforests, wet sclerophyll forest or open forest or plantations of pines.	**Foraging / dispersal**: Remnant, HVR and non-remnant vegetation (aerial species). This species does not breed in Australia and as such no potential breeding habitat occurs.	-
Glossy ibis *(Plegadis falcinellus)*	M	The Glossy ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains. The Glossy ibis is commonly in largest numbers in drying Top End grass/sedge swamps and Channel Country grass/forb meadows. The species is sometimes recorded in wooded swamps, artificial wetlands (such as irrigated fields), and in mangroves for breeding. The species may retreat to permanent wetlands and/or coastal areas (including tidal wetlands) during drought).	**Foraging / dispersal**: Wetlands with either shallow or deep waters. This species typically breeds in arid and semi-arid part of Australia so no potential breeding habitat occurs.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Glossy ibis roost in trees or shrubs usually near, but sometimes far, from water bodies. Australian breeding habitat types include wooded and shrubby swamps in the semi-arid and arid regions of the Northern Territory and Queensland. This includes Cooba (*Acacia stenophylla*), Eucalyptus/lignum swamps (*Muehlenbeckia florulenta*) of the Murray-Darling Basin and in Melaleuca/reed swamps at near-coastal breeding colonies in the south. Breeding has once been recorded in mangroves in the Northern Territory.		
Oriental cuckoo *(Cuculus optatus)*	M	The species uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears often along edges of forests, or ecotones between forest types.	**Foraging / dispersal**: Monsoon rainforest, wet sclerophyll forest, open woodlands and ecotones between forest types.	-
Red goshawk (*Erythrotriorchis radiatus*)	V	The Red goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. Riverine forests are also used frequently. Such habitats typically support high bird numbers and biodiversity, especially medium to large species which the goshawk requires for prey. The Red goshawk nests in large trees, frequently the tallest and most massive in a tall stand, and nest trees are invariably within one kilometre of permanent water. The Red goshawk occurs over wooded and forested lands of tropical and warm-temperate Australia, coastal and sub-coastal. This species prefers forest and woodland with a mosaic of vegetation types, large prey populations (birds), and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins.	**Nesting / foraging**: Tall emergent trees in areas of permanent water (watercourses and wetlands) within a landscape that supports a mosaic of vegetation types. **Foraging only**: Remnant open forest and woodland that support a mosaic of vegetation types. The vegetation types include eucalypt woodland,	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Habitat has to be open enough for fast attack and manoeuvring in flight, but provide cover for ambushing of prey. Therefore, forests of intermediate density are favoured, or ecotones between habitats of differing densities, e.g. between rainforest and eucalypt forest, between gallery forest and woodland, or on edges of woodland and forest where they meet grassland, cleared land, roads or watercourses. They avoid very dense and very open habitats. These habitats provide appropriate foraging conditions for the large Red goshawk, and a diversity and abundance of the medium to large birds taken as food. Immature birds have been reported from mangroves, open river floodplains, low open woodland, agricultural land and pasture, but such habitats are not used regularly. Nests are in tall trees within one kilometre of and often beside, permanent water (river, swamp, pool), usually in fairly open, biologically rich forest or woodland. The average distance of the nest tree to water was 164 m. Nest trees were significantly taller, with larger crown diameters, greater girth at breast height, and the height of the lowest live branch was higher than the tallest trees found in the immediate vicinity of random locations along rivers. Nest trees had an average height of 31.4 m, and an average girth at breast height of 2.9 m. Trees in 0.2 ha plots around the nest tree also had significantly higher canopy height, fewer small trees (girth less than 0.5 m), and more large trees (girth greater than 1 m) than random plots. Nests tend to be placed on a substantial horizontal limb often against a vertical branch arising from it. This species is a local migrant throughout Australia and inhabits coastal areas, islands, estuaries, inlets, rivers and inland lakes. The species will overfly a variety of terrestrial habitats (such as coastal dunes, tidal flats, grasslands, heathlands, woodland, eucalypt forests, rainforests and urban areas) but will also forage over wide expanses of open water.	open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins.	

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
Satin flycatcher *(Myiagra cyanoleuca)*	M	The Satin flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. • This species is known to inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands usually above the shrub layer • On migration, this species occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests as well as trees in open country and gardens.	**Foraging / dispersal**: Eucalypt forest and woodlands, at high elevations. This species typically breeds in south-eastern Australia so no potential breeding habitat occurs.	-
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	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 subspecies also prefers to forage and dust-bathe on bare ground under an open canopy of trees. Natural foraging habitat for the Squatter pigeon (southern) is any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species, on sandy or gravelly soils, within 3 km of a suitable, permanent or seasonal waterbody. Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody. Typically, the ground covering vegetation layer in foraging and breeding habitat is considerably patchy consisting of native, perennial tussock grasses or a mix of perennial tussock grasses and low shrubs or forbs. This patchy, ground layer of vegetation rarely exceeds 33% of the ground area. The remaining ground surface consisting of bare patches of gravelly or dusty soil and areas lightly covered in leaf litter and coarse, woody debris (e.g. fallen trees, logs and smaller debris). The patchiness of the	**Breeding / foraging**: Open forest to sparse, open woodland or scrub vegetation on land zones 5 and 7, within 1 km of permanent water. **Foraging only**: Open forest to sparse, open woodland or scrub vegetation on land zones 5 and 7, 1-3 km from permanent water. **Dispersal**: Any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies; OR woody vegetation (regrowth, HVR or remnant) that	Both RE and geology mapping indicates that neither land zone 5 or 7 occurs within the Project Area. Field surveys determined that cleared exotic pasture occurs as large contiguous patches in which paddock trees are rare and highly isolated. Aerial imagery indicates this occurs across the Project Area (outside of the western ridgeline, Middle Hill and Public Reserve). Due to the high exposure to

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		ground layer vegetation in patches of foraging and breeding habitats tends to be variable over a given area. In Queensland, Squatter pigeon (southern) foraging and breeding habitat is known to occur on well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills (i.e. Queensland Regional Ecosystem Land Zone 5), and lateritic (duplex) soils on low 'jump-ups' and escarpments (i.e. Queensland Regional Ecosystem Land Zone 7). The Squatter pigeon (southern) is known to access suitable waterbodies to drink on a daily basis. Waterbodies suitable for the subspecies include permanent or seasonal rivers, creeks, lakes, ponds, waterholes and artificial dams. The subspecies prefers to drink where there is gently sloping, bare ground on which to approach and stand at the water's edge. While patchy to moderate ground covering vegetation may occur along the banks of suitable water bodies, a small patch (less than a square metre) of bare ground at the water's edge is all that the bird requires. Squatter pigeon (southern) dispersal habitat is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Such patches of vegetation tend not to be suitable for the subspecies' foraging or breeding, but facilitate the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts.	facilitates the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts.	predators in these areas and ability for the bird to instead utilise the wooded vegetation patches to access waterbodies or other suitable habitat, exotic pasture areas are not considered to provide dispersal opportunities for the squatter pigeon (southern).
Grey falcon (*Falco hypoleucos*)	V	The grey falcon occurs in timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined water courses. It has also been observed foraging in treeless areas, tussock grassland and open woodland. At night, roosting may occur on areas of bare ground. When breeding this species utilises the disused nests of other raptors or corvids. Nests that occur in the tallest trees along watercourses, particularly	**Breeding / foraging**: Areas containing tall Eucalypt trees, located in association with ephemeral or permanent water.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Eucalyptus camaldulensis and *E. coolabah*, are preferred. However, like other falcons this species may also nest in telecommunication towers.	**Foraging only**: Lowland vegetation in any condition (regrowth, HVR or remnant).	
Painted honeyeater (*Grantiella picta*)	V	Painted honeyeater inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens. The species prefers habitat with more mature trees that host more mistletoes, particularly mistletoes in the genus *Amyema*. It is more common in wider blocks of remnant woodland than in narrower strips. The species is most common in woodlands dominated by Acacia spp. (e.g. brigalow *Acacia harpophylla*, weeping myall *A. pendula*, and mulga *A. aneura*), Belah (*Casuarina cristata*) and Bull-oak (*Allocasuarina luehmannii*). It also occurs in riparian woodland communities dominated by eucalypt species such as Eucalyptus camaldulensis. Painted honeyeater inhabits *Acacia* or *Eucalyptus* dominated woodlands and open forests and prefers habitat with more mature trees that host more mistletoes.	**Foraging / dispersal**: Dry forests and woodlands and riparian woodland communities (remnant or HVR condition) dominated by eucalypt species such as *Eucalyptus camaldulensis*, where there is an abundance of mistletoes in the genus *Amyema*.	-
White-throated needletail (*Hirundapus caudacutus*)	V/M	This species is regularly observed flying over forests, woodlands, pastoral areas, floodplains, lakes and coastlines. Indicative habitat also includes near margins of wetlands and human settlements. This species occurs over most types of habitat, as described above and may also fly between trees or in clearings, below the canopy, but are less commonly recorded flying above woodland.	**Roosting / foraging**: Remnant woodland areas on high elevations or hilly terrain. **Foraging only**: Above woodlands, HVR and regrowth or cleared	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
			paddocks (aerial species).	
Rufous fantail *(Rhipidura rufifrons)*	M	In east and south-east Australia, the Rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (E. *radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (E. *pilularis*) or Red Mahogany *(E. resinifera*); usually with a dense shrubby understorey. They also occur in subtropical and temperate rainforests, including temperate Lilly pilly (smithi) rainforest, and occasionally occur in secondary regrowth, following disturbance in forests or rainforests. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks (*Melaleuca spp.*).	**Breeding / foraging / dispersal**: Dense wet forests – rainforests, mangroves, the wet fern gullies in eucalypt forests and other dense vegetation. **Foraging / dispersal**: Dry forests and woodlands, including HVR and regrowth.	-
Star finch (eastern) (*Neochmia ruficauda ruficauda*)	E	The Star finch (eastern) occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water (Garnett 1993; Gould 1865; Holmes 1996). It also occurs in cleared or suburban areas such as along roadsides and in towns. The Star finch (eastern) was observed on the Namoi River in New South Wales, on sloping river banks covered with grass and herbs, and amongst beds of rushes growing along the side of the river (Gould 1865). Studies at nine former sites of the Star finch (eastern) found that the habitat consisted mainly of woodland. These habitats are dominated by trees that are typically associated with permanent water or areas that are regularly inundated; the most common species are *Eucalyptus coolabah*, *Eucalyptus*	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys. The star finch (eastern) is thought to be extinct from southern Queensland, where the Project Area is situated.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		tereticornis, *Eucalyptus tessellaris*, *Melaleuca leucadendra*, *Eucalyptus camaldulensis* and *Casuarina cunninghamii* (Holmes 1996). Sites from which recent records have been obtained have been dominated by grasses or have been in areas where the native vegetation has been partially cleared (DOTE 2014t). For example, at Wowan, the Star finch (eastern) was recorded near a road running through grassland (formally eucalypt woodland interspersed with vine forest) with some scattered shrub regrowth, and at Aramac, it was recorded in the grounds of a hotel (Holmes 1996 & 1998). These latter records support earlier reports from Blackall in Queensland, where the Star finch (eastern) was said to have foraged in the streets and yards of the township, and at Inverell in New South Wales, where 20 were observed feeding in fig trees near a house.		
Australian painted snipe (*Rostratula australis*)	E	The Australian painted snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia* or canegrass or sometimes tea-tree (Melaleuca). The Australian painted snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber. This species requires suitable wetland areas even in drought conditions. The species can move to suitable habitat if necessary. The Australian painted snipe is not known to associate with any other species or subspecies of fauna or flora that is listed as threatened under the EPBC Act.	**Breeding**: Small exposed islands within freshwater wetlands with a combination of exposed muddy areas, dense tall or low vegetation cover. **Foraging / roosting**: Permanent freshwater wetlands with areas of bare wet mud and both upper and canopy cover nearby. **Temporary foraging / dispersal**: Ephemeral	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
			shallow waterbodies including gilgai.	
Latham's snipe *(Gallinago hardwickii)*	M	Latham's snipe occurs in temperate and tropical regions of Australia (Driscoll 1993). Its altitudinal range extends from sea-level (ie the coast) to approximately 2,000 m above sea-level (Chapman 1969; Driscoll 1993). In Australia, Latham's snipe occurs in a wide variety of permanent and ephemeral wetlands (Naarding 1981). It usually occurs in open, freshwater wetlands that have some form of shelter (usually low and dense vegetation) nearby. It generally occupies flooded meadows, seasonal or semi-permanent swamps, or open waters (Frith et al 1977; Naarding 1983), but various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creeks or river margins, river pools and floodplains (Frith et al 1977; Naarding 1981 & 1983). The structure and composition of the vegetation that occurs around these wetlands is not important in determining the suitability of habitat (Naarding 1983). As such, snipe may be found in a variety of vegetation types or communities including tussock grasslands with rushes, reeds and sedges, coastal and alpine heathlands, lignum or tea-tree scrub, button-grass plains, alpine herbfields and open forest. Latham's snipe sometimes occurs in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers (Frith et al 1977; Naarding 1983; Patterson 1991). These habitats are most commonly used when the birds are on migration. They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches, ricefields, orchards, saltworks, and sewage and dairy farms. They can also occur in various sites close to humans or human activity (eg near roads,	**Foraging / roosting**: Wetlands with either shallow or deep waters fringed with dense low vegetation. Species does not breed in Australia and as such no breeding habitat occurs.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		railways, airfields, commercial or industrial complexes) (Frith et al 1977; Naarding 1983). The foraging habitats of Latham's snipe are characterised by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (eg low, dense vegetation) (Frith et al 1977; Todd 2000). The snipe roosts on the ground near (or sometimes in) foraging areas, usually in sites that provide some degree of shelter, eg beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable.		
Yellow wagtail (*Motacilla falva*)	M	Habitat for the Yellow wagtail is highly variable, but typically includes open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, and sometimes utilise tidal mudflats and edges of mangroves (DoE, 2015b).	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys. The yellow wagtail is considered a vagrant in southern Queensland, where the Project Area is situated.
Common sandpiper (*Actitis hypoleucos*)	M	The Common sandpiper is known to occur in a range of wetland environments, both coastal and inland. The species is most abundant in mangrove inlets but is found on narrow muddy margins or rocky shores. It has also been recorded in estuaries and deltas of streams, on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties (DAWE, 2020; Geering et al., 2007).	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
				This species is primarily coastal, and the Project Area is approximately 250 km inland.
Sharp-tailed sandpiper (*Calidris acuminata*)	M	In Australasia, the Sharp-tailed sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys. This species is primarily coastal, and the Project Area is approximately 250 km inland.
Pectoral sandpiper (*Calidris melanotos*)	M	This species is usually found in coastal or near coastal habitat but very occasionally found further inland. It prefers shallow fresh waters, often with low grass or other herbage such as samphire. It also occurs in swamp margins, flooded pastures, sewage ponds, and occasionally tidal areas and saltmarshes (Pizzey & Knight 1997).	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys. This species is primarily coastal, and the Project

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
				Area is approximately 250 km inland.
Eastern osprey (*Pandion haliaetus*)	M	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in north-western Australia. They require extensive areas of open fresh, brackish or saline water for foraging (DAWE, 2020).	-	This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys. This species is primarily coastal, and the Project Area is approximately 250 km inland.
Threatened mammals				
Large-eared pied bat (*Chalinolobus dwyeri*)	V	Natural roosts may depend heavily on sandstone outcrops/escarpments and this species has been observed in disused mine shafts, caves, overhangs and disused Fairy martin (*Hirundo ariel*) nests for shelter and to raise young. The species also possibly roosts in the hollows of trees, dry and wet sclerophyll forest, Cyprus-pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland and sandstone outcrop country. In South-east Queensland, the species has primarily been recorded from higher altitude among moist tall open forest adjacent to rainforest. Recent habitat modelling based on surveys in the southern Sydney region suggests that the Large-eared pied bat is largely restricted to the interface of sandstone escarpment for roost habitat and relatively fertile valleys for	**Roosting**: Sandstone cliffs and escarpments, disused mine-shafts, caves and overhangs adjacent to suitable foraging habitat. **Foraging**: Fertile valley woodland areas (remnant and HVR) within 10 km of roosting habitat.	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		foraging habitat. Recent survey work in the Brigalow Belt South region of NSW supports this modelling. Almost all records have been found within several kilometres of cliff lines or rocky terrain. The majority of records are from canopied habitat, suggesting a sensitivity to clearing, although narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used. It is considered that some populations of this species would rely in part on Brigalow (Acacia harpophylla dominant and co-dominant) communities. The Large-eared pied bat feeds on insects and usually flies at mid canopy level (6 to 10 m) from the ground but have also been documented flying low along creek lines.		
Northern quoll (*Dasyurus hallucatus*)	E	The Northern quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Northern quoll are also known to occupy non rocky lowland habitats such as beachscrub communities in central Queensland. Northern quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected but can also include tor fields or caves in low lying areas such as in Western Australia. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes. Dens are made in rock crevices, tree holes or occasionally termite mounds. Northern quolls sometimes occur around human dwellings and campgrounds. Northern quolls appear to be most abundant in habitats within 150 km of the coast.	**Denning / foraging**: Remnant eucalypt forest or woodland with high structural diversity containing large diameter trees, termite mounds or hollow logs and rocky habitats such as escarpments, caves and hill slopes with large boulders. **Foraging / dispersal**: Eucalypt forest and woodlands, rainforests, shrubland, grasslands and desert in proximity	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Recent surveys throughout Queensland have suggested Northern quolls are more likely to be present in high relief areas that have shallower soils, greater cover of boulders, less fire impact and were closer to permanent water. Rocky habitats support higher densities and/or longer lived individuals within the species range, due to more protection from predators, better nutrition and less exposure to agricultural practices. Rocky habitats also supported a higher density of Northern quoll dens. Breeding success is higher in animals that have a den near a creek line.	to denning habitat and permanent water.	
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	Although commonly recorded in some areas such as the Brigalow Belt South and Nandewar Bioregions in north-eastern NSW, this species occurs in a range of inland woodland vegetation types, including box, ironbark, cypress pine, mallee, bull-oak, brigalow and belah woodlands/forests and will roost in tree hollows, crevices and under loose bark within these communities. The South-eastern long-eared bat forages within the understorey of the abovementioned communities, including the ground. Limited information is available regarding the roosting ecology of this species, however surveys undertaken by others suggest that these bats may change roosting sites as frequently as each day (most roosts used for just a single day) and are likely to travel across large distances between consecutive roosts (up to 2 km). No information is available on maternity roosts where larger groups may form.	**Roosting / foraging**: Forests and woodlands dominated by *Allocasuarina luehmannii*, *Acacia harpophylla*, *Casuarina cristata*, *Eucalyptus camaldulensis*, and various other types with a dense cluttered understorey AND with hollow bearing trees or trees with decorticating bark. **Foraging only**: Woodlands and low woodlands (remnant, HVR or regrowth) with a dense cluttered understorey (lacks	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
			hollow bearing trees and trees with decorticating bark).	
Greater glider (*Petauroides Volans*)	V	Greater glider typically occurs in abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Greater glider favour forests with a diversity of Eucalypt species due to seasonal variation in its preferred tree species. Distribution can be patchy even in suitable habitat. The species does not occur in rainforests. During the day, this species spends most of its time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. It is primarily folivorous, with a diet mostly comprising the leaves and flowers of Myrtaceae (e.g. eucalypt) trees. The greater glider is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. An isolated inland subpopulation occurs in the Gregory Range west of Townsville, and another in the Einasleigh.	**Breeding / denning / foraging**: Highly connected, eucalypt-dominated woodlands containing 2-4 hollows medium-large in size per ha. **Foraging / dispersal**: All other connected eucalypt-dominated woodlands within 120 m of breeding / denning habitat.	-
Koala (*Phascolarctos cinereus*)	V	Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. The distribution of this habitat is largely influenced by land elevation, annual temperature and rainfall patterns, soil types and the resultant soil moisture availability and fertility. Preferred food and shelter trees are naturally abundant on fertile clay soils.	**Refuge / foraging:** Vegetation with at least two koala food trees, OR one koala food tree with more than 50% cover, on alluvial substrates (land zone 3) OR more than 200 ha contiguous.	Field surveys completed to date have not found any trees that may be considered shelter trees for koala within the Project Area. Paddock trees in non-remnant areas were rare and isolated, generally

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Along the Great Dividing Range and the coastal belt throughout the species' range, Koalas inhabit moist forests and woodlands mostly dominated by Eucalyptus species. In coastal lowlands in Queensland and New South Wales, Koalas are also found in vegetation communities dominated by Melaleuca or Casuarina species. On the western slopes, tablelands and plains in Queensland and New South Wales, Koalas are found in sub-humid Eucalyptus-dominated forests and woodlands in riparian and non-riparian environments, and some Acacia-dominated forests and woodlands in non-riparian environments. In the dry, subtropical to semi-arid environments in the western parts of the species' range, Koalas inhabit Eucalyptus-dominated forests and woodlands, particularly in the vicinity of riparian environments, and Acacia-dominated forests, woodlands and shrublands. Koalas are also known to occur in modified or regenerating native vegetation communities, as well as urban and rural landscapes where food trees or shelter trees may be highly scattered. There is a growing body of evidence that identifies the importance of shelter (non-food) trees to koalas. Shelter trees may be equally important as food trees and should be weighted as such when assessing habitat suitability. Shelter trees play an essential role in thermoregulation and are likely to be selected based on height, canopy cover and elevation (i.e. trees occurring in gullies are preferable). The difficulty in regards to shelter trees is that, unlike food trees, there is no identified sub-set of forest and woodland trees known to be shelter trees. The use of a particular tree species, or individual trees within a species is highly contextual and variable.	**Foraging / dispersal:** Other vegetation containing at least one koala food tree and / or shelter trees.	average in size and highly impacted by edge effects.
Threatened reptiles				

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
Adorned delma (*Delma torquata)*	V	The Adorned delma normally inhabits eucalypt-dominated woodlands and open-forests in Queensland Regional Ecosystem Land Zones (LZ) 3, 9 and 10. The Adorned delma has been recorded from rocky areas associated with dry open forests. This species occurs in open eucalypt and acacia woodland with an understorey of native grasses and loose rocks. The Adorned delma has also been recorded from eucalypt woodland adjacent to semi-evergreen vine thicket. This species shelters under rocks, fallen timber, leaf litter and in soil cracks. The presence of rocks, logs, bark and other coarse woody debris, and mats of leaf litter (typically 30 to 100 mm thick) appears to be an essential characteristic of Adorned delma microhabitat and is always present where the species occurs.	**Breeding / foraging**: Eucalypt-dominated woodlands and open-forests or non-remnant exposed rocky areas on land zones 3, 9 and 10 that contain sufficient microhabitat features (logs, bark and other coarse woody debris as well as mats of leaf litter).	-
Ornamental snake (*Denisonia maculate*)	V	The species is associated with moist or ephemeral areas (e.g. floodplains, clay pans and water bodies), with appropriate resources in the form of shelter (e.g. fallen timber, deep cracking soils) and prey species (i.e. frogs). This species is known only within the Fitzroy and Dawson River drainage systems in the Brigalow Belt region of Queensland where it has been found to be most abundant in heavily gilgaied (melonhole) Brigalow. However, this species is also known from habitats without Brigalow. This species tolerates relatively simple habitat structure (i.e. grasslands and cleared paddocks) and as such may be encountered within unmapped sections of project footprint where shelter and frogs are present. During dry periods, the species seeks refuge within soil cracks on gilgai mounds.	**Breeding / foraging**: Woodlands and open forests associated with moist areas, particularly gilgais and depressions, but also lake margins and wetlands on clay soils containing sufficient microhabitat features (soil cracks or fallen woody debris).	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		Important microhabitats for this species are likely to include cracking soils and ground cover (including perennial grass clumps, leaf litter, rocks, fallen timber etc).		
Yakka skink (*Egernia rugosa*)	V	Yakka skink habitat is amongst dense ground vegetation, fallen timber or rock outcrops in open dry sclerophyll forest (ironbark) or woodland, Brigalow forest, open shrub land, and lancewood forest on coarse gritty soils in the vicinity of low ranges, foothills and undulating terrain with good drainage. Important microhabitats for this species include rocky outcrops, hollow logs, animal burrows and ground cover (including perennial grass clumps, leaf litter, rocks, fallen timber etc). Colonies have been found in large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes. However, the species is not generally found in trees or rocky habitats. This species can occur in Brigalow communities as listed under the EPBC Act and in habitats which also support the Brigalow scaly-foot.	**Breeding / foraging**: Dry forest, woodland and scrub on land zone 3, 5, 7, 9 and 10 containing: • large hollow logs • cavities or borrows under large fallen trees • tree stumps • logs • stick-racked piles of logs • large rocks and rock piles • deeply eroded gullies, tunnels and sinkholes.	-
Dunmall's snake (*Furina dunmalli*)	V	Dunmall's snake has been found in a broad range of habitats, including: • Forests and woodlands on black alluvial cracking clay and clay loams dominated by Brigalow (*Acacia harpophylla*), other Wattles (*A.*	**Breeding / foraging**: Forest and woodland areas containing sufficient microhabitat features (soil cracks,	-

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		burowii, A. deanii, A. leioclyx), native Cypress (*Callitris spp.*) or Bull-oak (*Allocasuarina luehmannii*) • Various Blue spotted gum (*Corymbia citriodora*), Ironbark (Eucalyptus crebra and E. melanophloia), White cypress pine (Callitris glaucophylla) and Bull-oak open forest and woodland associations on sandstone derived soils In other environments, one specimen was found on the edge of dry vine scrub near Tarong Power Station, Queensland, whilst another was found in hard ironstone country (Queensland Regional Ecosystem Land Zone 7) at Lake Broadwater near Dalby, Queensland. Little is known about the ecological requirements of Dunmall's snake, however, the species has been found sheltering under fallen timber and ground litter and may use cracks in alluvial clay soils. Records indicate the species prefers habitats between 200 to 500 m above sea level.	leaf litter or fallen woody debris).	
Fitzroy River Turtle (*Rheodytes leukops*)	V	The Fitzroy river turtle is found in rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles (DSEWPaC 2011aa). Preferred areas have high water clarity, and are often associated with Ribbonweed (*Vallisneria* sp.) beds (Cogger *et al* 1993). Common riparian vegetation associated with the Fitzroy river turtle includes Blue gums (*Eucalyptus tereticornis*), River oaks (*Casuarina cunninghamiana*), Weeping bottlebrushes (*Callistemon viminalis*) and Paperbarks (*Melaleuca linariifolia*) (Tucker *et al* 2001). Turtles often associate with logs in deeper water, and may sit on the downstream side or under rocks in fast flowing riffles (Cann 1998; Tucker *et al* 2001).	-	No suitable watercourses have been previously identified within the Project Area. This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys.

Species	EPBC Act status	Community or habitat description[1]	Habitat definition rules	Site specific considerations
		It is thought that the Fitzroy river turtle has an affinity for well-oxygenated riffle zones, moving into deeper pools as the riffle zones cease to flow (Tucker *et al* 2001). However, recent studies have captured several turtles from deep pools (Gordos *et al* 2003a; 2003b, 2004).		
White-throated snapping turtle (*Elseya albagula*)	CE	The species is a habitat specialist, preferring clear, flowing, well-oxygenated waters. It occurs in non-flowing densities at much lower densities. It seems to be suited to the aerobic margins of large slow-flowing reaches and large non-flowing pools and is less suited to the deeper habitats of larger pools with low dissolved oxygen (DEE, 2017). The White-throated snapping turtle is found in sections of stream characterised by steep undercut banks, rocky or sandy substrates, submerged boulders or logs for refuge and usually in proximity to riffle zones.	-	No suitable watercourses have been previously identified within the Project Area. This species is considered an unlikely occurrence within the Project Area and has not been recorded during previous surveys.

Table note: 1. Habitat descriptions are derived from the Significant Species Management Plan (SSMP). Refer to SSMP (Santos 2021) for in-text citations and reference list.

Appendix B Detailed Ecological Assessment Methodology

Vegetation Community Assessment

Regional ecosystem assessment

The extent, classification and condition of ground-truthed vegetation communities will be validated in accordance with the Methodology for Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland (Neldner, et al., 2019). This includes traversing the survey area undertaking tertiary and quaternary level assessments. As per the Queensland Herbarium methodology (Neldner, et al., 2019), tertiary level site assessments are undertaken within a 10 m by 50 m quadrat, collecting the following information:

- vegetation structure, species composition and percentage cover for each structural layer
- aspect and slope
- soil type
- landform
- disturbance type and severity
- RE and remnant status.

Quaternary-level sites are utilised to verify vegetation units and confirm dominant characteristic species. Structural analysis include recording the height class and life form of the dominant species within the mid and canopy strata as per (Neldner, et al., 2019). Time-encoded digital photographs will be taken at each tertiary and quaternary site assessment as a reference.

RE classification is determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the Regional Ecosystem Description Database (REDD). Condition status for woody vegetation will be evaluated utilising the definitions of remnant vegetation under the Queensland *Vegetation Management Act 1999* (VM Act):

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
- High-value regrowth (HVR): areas previously cleared or disturbed (e.g. by wildfire) over 15 years ago and containing woody vegetation floristically and structurally consistent with the RE but typically less than 70% of the height and less than 50% density of the RE.
- Regrowth or non-remnant: areas previously cleared or otherwise significantly disturbed.

Functionality assessment

Vegetation communities assessed to comprise remnant or HVR vegetation and analogous to an RE with an endangered biodiversity status (under the Queensland *Environmental Protection Act 1994*), will also be assessed for functionality. Four condition attributes as per Table B1 below will be assessed to determine if the patch is considered functional.

Table B1 Minimum ecosystem attributes for functional non-grassland ecosystems

Attribute	Cut-off
Patch size	>0.5 ha
Total non-native perennial vegetative cover	<50%
Recruitment to EDL	Yes
Minimum median canopy height	>1/3 of the median benchmark

Threatened ecological community assessments

Threatened Ecological Community (TEC) assessments will be undertaken to confirm the presence of TECs identified in this document, namely:

- Brigalow (*Acacia harpophylla* dominated and co-dominated) TEC (Brigalow TEC)
- Poplar Box Grassy Woodland on Alluvial Plains (Poplar box TEC)
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT TEC)
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Coolibah TEC)
- Weeping Myall Woodlands (Weeping myall TEC).

The results of the regional ecosystem assessment and functionality assessment will be used to assess a patch of vegetation against the descriptors and condition thresholds in the relevant Listing Advice per TEC. The relevant TECs (above) can be identified in any season and no specific timing of surveys to conduct these assessments is required.

Opportunistic Threatened Flora Searches

Targeted searches for threatened flora species identified to be known, likely or potential occurrences in this document will be undertaken in areas of potentially suitable habitat identified in habitat mapping as well as areas confirmed during vegetation community assessments.

Fauna Species Habitat Assessment

Fauna species habitat assessments will be undertaken in areas of representative potential fauna habitat (as identified in habitat mapping or as confirmed during vegetation assessments) and include searches for MNES individuals. A review of known, likely or potential fauna species and the habitat definitions (Appendix A) will be completed first to gain an understanding of the species and the species' preferred microhabitat features likely to occur in the area. Record databases, recent reports and additional mapping sources if available will also be reviewed to determine if any changes have occurred that may influence a species presence in the area.

Fauna species habitat assessments will include all methods detailed in Table B2 below.

Table B2 Fauna Species Survey and Habitat Assessment

Method	Target fauna	Description
Habitat assessment	Reptiles, mammals, amphibians and birds	Habitat assessments are to be completed across the Project Area during surveys. Each habitat assessment site is one hectare (100 m x 100 m, or 200 m x 50 m). Habitat attributes recorded during the assessment include: • Vegetation structure and dominant species, including a description of canopy, shrub and ground layer structure and composition. • Soil composition and landform • Presence and abundance of tree hollows and stags, including hollow size. Hollow abundance per size should be considered in the context of the patch size to determine density and potential suitability for greater glider. • Presence and abundance of woody debris such as habitat logs and ground timber. • Rocky habitat such as surface rocks, boulders, crevices, overhangs and caves. • Proximity to water (both permanent and ephemeral). • Disturbance from invasive weeds/pests. • Other disturbances such as grazing pressure, clearing, thinning or fire.

Method	Target fauna	Description
		• Any other significant habitat features, or values present, such as leaf litter, gilgai, decorticating bark, dense grass/shrub shelter, seeding grass cover, fruiting plants, nectar and pollen producing plants (i.e. mistletoe), and koala food trees. This approach conservatively assumes that where suitable habitat is present the species is also present.
Active search	Reptiles, mammals, amphibians and birds	Searches are to be undertaken including scanning the trees and ground, searching beneath microhabitat such as rocks, fallen timber and peeling bark, digging through leaf litter and soil at tree bases and flushing birds from areas with a dense or grassy ground cover. Physical disturbance to habitat features and reptiles is kept to a minimum. Active searching is completed at habitat assessment sites across the Project Area.
Scat and sign search	Reptiles, mammals, amphibians and birds	Searches are to be undertaken including looking for signs of animal activity, including tracks, scats, scratches, bones, fur, feathers, nests, foraging holes and diggings. Scat and sign searches are completed at habitat assessment sites across the Project Area.
Diurnal bird survey	Birds	Roaming/meandering bird surveys are to use both visual and auditory identification. Surveys are to commence at dawn and continue throughout the day. Active birding is also to be completed at farm dam sites.
Incidental observations	Reptiles, mammals, amphibians and birds	All fauna observed incidentally within or in close proximity to the Project Area are to be recorded, including those seen while travelling along roads and tracks.