



**Baralaba South Project  
Environmental Impact Statement**

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CHAPTER 7

**Flora and Fauna**

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## 7 Flora and Fauna

This chapter describes the assessment of potential impacts on the existing ecological environment with regard to terrestrial and aquatic flora and fauna, and aquatic ecosystems (including groundwater dependent ecosystems (GDE)) that may be referred to as water-dependent assets within and around the Baralaba South Project (the Project). Flora and fauna is identified as a critical matter within the TOR for the Project.

Several assessments have been conducted for the Project, including the following:

- Terrestrial Ecology Assessment (Appendix F);
- Aquatic Ecology Assessment (Appendix G);
- Groundwater Dependent Ecosystem Assessment (Appendix H);
- Stygofauna Assessment (Appendix I); and
- Biodiversity Offsets Strategy (Appendix J).

In addition to the area of the MLA, this chapter addresses potential impacts arising from the realignment of the Moura-Baralaba Road along the MLA boundary and off-lease infrastructure, including the proposed upgrade of the power supply infrastructure and water extraction/release infrastructure.

On 18 October 2012, the Project was determined to be a 'controlled action' under the EPBC Act (EPBC Referral 2012/6547). This controlled action decision was amended on 22 October 2013 to include the impacts of coal seam gas developments and large coal mining developments on water resources (sections 24D and 24E). Section 45 of the EPBC Act requires the Project to be assessed by an EIS process accredited under the environmental assessment Bilateral Agreement. The EIS must address the controlling provisions for the Project.

The controlling provisions for the Project, with regards to its potential impacts on MNES are:

- listed threatened species and communities (sections 18 and 18A);
- listed migratory species (sections 20 and 20A): and
- water resources (24D and 24E)

Aspects relating to MNES have been considered in this chapter. The stand-alone assessment of MNES is in Chapter 9, MNES.

### 7.1 Environmental objectives and performance outcomes

#### 7.1.1 Flora and fauna

This chapter has been prepared to assist the DES in carrying out an environmental objective assessment in respect of the following environmental objectives prescribed in Schedule 8, Part 3, Division 1 and Division 2 of the EP Regulation (also prescribed in section 8.1 of the Project TOR) relevant to flora and fauna (collectively, the flora and fauna objectives):

- the activity is operated in a way that protects the environmental values of flora and fauna;
- the choice of the site, at which the activity is to be carried out, minimises serious environmental harm on areas of high conservation value and special significance;
- the location for the activity on a site protects all environmental values relevant to adjacent sensitive use; and
- the design of the facility permits the operation of the site, at which the activity is to be carried out, in accordance with best practice environmental management.

The detailed assessment presented in this chapter and in the relevant appendices demonstrates that the Project will achieve a performance outcome for each flora and fauna objective.

Specifically, the Project will achieve item 2 of the performance outcomes for each flora and fauna objective to satisfy section 2(4) of Schedule 8 of the EP Regulation because the Project will be operated in a way that achieves the following:

- a) activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of the land;
- b) areas disturbed will be rehabilitated or restored to achieve sites:
  - i) that are safe and stable;
  - ii) where no environmental harm is being caused by anything on or in the land; and
  - iii) that are able to sustain an appropriate land use after rehabilitation or restoration;
- c) the Project will be managed to prevent or minimise adverse effects on the environmental values of land due to unplanned releases or discharges, including spills and leaks of contaminants;
- d) the application of water or waste to the land will be sustainable and will be managed to prevent or minimise adverse effects on the composition or structure of soils and subsoils;
- e) areas of high conservation value and special significance likely to be affected by the proposal will be identified and evaluated and any adverse effects on the areas will be minimised, including any edge effects on the areas, and critical design requirements will prevent emissions having an irreversible or widespread impact on adjacent areas; and
- f) the Project, and components of the Project, will be carried out on the site in a way that prevents or minimises adverse effects on the use of surrounding land and allows for effective management of the environmental impacts of the Project.

### **7.1.2 Water quality**

A performance outcome can also be achieved with respect to the water quality environmental objective outlined in Schedule 8 of the EP Regulation (also prescribed in section 8.2 of the Project TOR) relevant to flora and fauna. The objective is that the activity will be operated in a way that protects the environmental values of wetlands (including soaks and springs) and GDEs.

The Project will achieve item 2 of the performance outcomes for that environmental objective to satisfy section 2(4) of Schedule 8 of the EP Regulation, because the Project will be managed in a way that prevents or minimises adverse effects on wetlands.

Assessment of water quality aspects not relating to flora and fauna is provided in Chapter 4, Surface Water.

### **7.1.3 Water resources**

A performance outcome can also be achieved with respect to the water resource's environmental objective prescribed in section 8.3 of the Project TOR relevant to flora and fauna. The objective is that the construction and operation of the Project should aim to maintain environmental flows, water quality, instream habitat diversity, and naturally occurring inputs from riparian zones (including GDEs) to support the long-term maintenance of the ecology of aquatic biotic communities (including stygofauna).

The Project will achieve that environmental objective because the Project will be managed in a way that achieves the following:

- a) any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland; and

- b) the Project will be managed so that adverse effects on environmental values are prevented or minimised.

Assessment of water resources not relating to flora and fauna is provided in Chapter 4, Surface Water.

## 7.2 Regional and local setting

The Project is located approximately 8 km south of the town of Baralaba and 115 km west of Rockhampton within the Bowen Basin in central Queensland. The Project is located within the Dawson River Downs sub-region of the Brigalow Belt North Bioregion and the Lower Dawson Sub-catchment Area of the Fitzroy Basin.

The region experiences sub-tropical conditions with a distinctly dry winter (BoM, 2023). Rainfall records from 1889–2023 (Chapter 2, Table 2.8) for the weather stations listed in Chapter 2, Table 2.7, estimate that, the average annual rainfall varies between 664 mm recorded at Moura Post Office (039071), to 696 mm recorded at Baralaba Post Office (039004). The region receives a pronounced wet season, with approximately 65% of the annual rainfall recorded between November and March (BoM, 2018).

- Baralaba Post Office recorded 696 mm;
- SILO Baralaba Grid recorded 680 mm; and
- Moura Post Office recorded 664 mm.

Temperature records are available from the Moura Post Office (039071), the Baralaba Post Office (039004) and the SILO Baralaba Grid that have been recorded annually between 1889 and 2019. Average annual temperatures have ranged from approximately 14.0°C (min.) to 29.1°C (max.) at Moura Post Office; and average temperatures have ranged from approximately 14.7°C (min.) to 29.5°C (max.) at Baralaba Post Office; and between 14.6°C (min.) to 29.4°C (max.) at the SILO Baralaba Grid. Average monthly minimum and maximum relative humidity has been measured at 9:00 am and 3:00 pm at the Baralaba Post Office (039004). Relative humidity is estimated to range between 40 and 66%.

Existing land uses within the region include:

- agricultural activities (cattle grazing, cultivation and broadacre cropping); and
- open cut coal mining, occurring north and south of the Project.

Coal mines within 25 km of the Project include:

- Dawson (Moura) Mine; and
- Baralaba North Mine.

The Project is located in the floodplain of the Dawson River, a perennial watercourse located to the west of the MLA that flows in a northward direction. The Dawson River is the most significant watercourse in proximity to the Project, with ephemeral watercourses, drainage lines and wetlands also occurring within the landscape. Banana Creek is situated to the south and south-west of the MLA and flows into the Dawson River (Chapter 2, Project Description, Figure 2-18). There are several wetlands mapped within the Project area, including one lacustrine wetland and three palustrine wetlands. A minor drainage feature (stream order 1, 2 and 3) also occurs within the Project area. This is mapped as an unnamed tributary of the Dawson River that flows through the Project area, exiting at the north-east boundary of the Project's mining lease and converging with an anabranch of the Dawson River approximately 1.7 km downstream of the Project area. The reach of this waterway closest to the confluence with the Dawson River Anabranch is informally referred to as Shirley's Gully.

The Project area is relatively flat with ground elevations ranging from 75 mAHD to 110 mAHD. The western portion of the Project area is low-lying and encompasses the floodplain of the Dawson River and Banana Creek. The landform gently rises towards higher elevations in the eastern portion of the study area. Most of the Project area is cleared grasslands, with small, isolated patches of remnant vegetation along the western boundary and associated drainage lines of the Dawson River.

The Project area is bisected by a decommissioned rail corridor (Dawson Valley Branch Railway) that runs in a north-south direction. The Moura-Baralaba Road traverses the eastern portion of the MLA and forms a partial boundary to the Project area in the north-east.

The Project area does not form part of, or directly adjoins, any protected areas (i.e. national parks, conservation reserves, state forests). The Blackdown Tableland National Park is approximately 72 km north-west of the Project area, while Dawson Range State Forest is approximately 14 km west of the Project. No world heritage areas are located in the region. The Great Barrier Reef World Heritage Area is located approximately 386 km downstream from the Project.

## 7.3 Study areas and methodology

This section outlines the study areas and assessment methodology undertaken for each component of the flora and fauna assessment (terrestrial ecology, aquatic ecology, GDEs and stygofauna).

### 7.3.1 Terrestrial ecology

To describe the biodiversity and natural environmental values of the Project, an assessment of terrestrial ecology values for the Project area was undertaken by EcoSM (Appendix F, Terrestrial Ecology Assessment). The objectives of the Terrestrial Ecology Assessment (EcoSM, 2023) were to assess the potential impacts of the Project on terrestrial ecology values of the Project area and surrounding areas and particularly MNES and MSES.

As the Project was determined to be a controlled action in October 2012 (EPBC Referral 2012/6547) subsequent 'listing events', such as the new listing of a species or ecological community under the EPBC Act are not required to be assessed. As such, only those species listed as threatened (endangered or vulnerable) under the EPBC Act at the time of declaration of the controlled action are considered in the assessment of MNES, however, where the EPBC listing status of a species listed at the time the declaration was made has changed, the most current listing status is presented. For example, given the Greater Glider was not listed as an endangered species under the EPBC Act until 2022, this species is not subject to further approvals from a federal level and not assessed as such within, however, it is assessable under the NC Act and is subject to State legislation and assessments.

#### 7.3.1.1 Study area

The terrestrial ecology study area for the Project comprises:

- the Project site (MLA 700057);
- the water release/extraction infrastructure and water pump station areas;
- the realignment area of the Moura-Baralaba Road;
- the proposed ETL (incorporating two ETL alignment options) herein referred to as the ETL study area; and
- an additional investigation area (incorporating the vegetation adjacent to the Project area).

The terrestrial ecology study area is shown on Figure 7.1. The third-party infrastructure will be subject to separate permitting processes and may be subject to change.

### 7.3.1.2 Desktop assessment

A desktop assessment was undertaken to identify and present the ecological values mapped within the terrestrial ecology study area. The desktop assessment included a review of Commonwealth and State databases and mapping, literature reviews, ecology assessments completed at nearby locations and aerial photographs. Database searches were undertaken within 25 km of the boundary of the terrestrial ecology study area and therefore incorporates the Moura-Baralaba Road realignment, off-lease water release/extraction infrastructure and the ETL study area. The results of the desktop assessment (described in Appendix F, Terrestrial Ecology Assessment) informed the field survey design and methodology.

### 7.3.1.3 Field survey

The terrestrial ecology surveys have been undertaken by suitably qualified ecologists in accordance with all required permits and approvals. Seasonal surveys were undertaken within the Project area over five days in the 2017 post-wet season (16–20 May 2017) and over five days in the 2017 dry season (16–20 December 2017). A targeted flora survey was carried out on 9 March 2018. This survey was restricted to a patch of non-remnant vegetation where threatened flora species were recorded during the dry season survey within the Project area.

Ecology surveys were also undertaken of the additional investigation area over nine days in the 2020 post-wet season (6–14 May 2020) and of the ETL study area over three days in the 2020 dry season (23–25 September 2020).

The field assessments considered the following survey guidelines in their survey methods:

- 'Survey guidelines for Australia's threatened birds' (DEWHA, 2010a);
- 'Survey guidelines for Australia's threatened bats' (DEWHA, 2010b);
- 'Survey guidelines for Australia's threatened reptiles' (SEWPaC, 2011a);
- 'Survey guidelines for Australia's threatened mammals' (SEWPaC, 2011b);
- 'EPBC Act Referral guidelines for the vulnerable Koala (combined populations of Queensland, New South Wales and Australian Capital Territory)' (DoE, 2014a);
- 'Draft Referral guidelines for the nationally listed Brigalow Belt reptiles' (SEWPaC, 2011c);
- 'Referral guidelines for 14 birds listed as migratory species under the EPBC Act' (DoE, 2015a);
- SPRAT Database (DoEE, 2019b-j) profiles for relevant EPBC Act listed species and communities;
- 'Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community' (DoE, 2013b);
- 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre *et al.*, 2018);
- 'Methodology for survey and mapping of REs and vegetation communities in Queensland', version 4.0 - 5.1 (Neldner *et al.*, 2017, 2019 and 2020); and
- 'Flora Survey Guidelines—Protected Plants' (DEHP, 2016b; DES, 2019).

The total flora survey effort included:

- 11 detailed secondary sites;
- 68 tertiary sites;
- 53 quaternary sites;
- 102 quaternary photo monitoring sites;
- 15 habitat quality plots;
- random traverses; and
- collection of ancillary information.

The location of each secondary, tertiary, and quaternary flora site is shown in Figure 7.2.

A summary of the total fauna survey effort is provided in Table 7.1, complete details of all field assessment methodologies are available in Appendix F, Terrestrial Ecology Assessment. Locations of each fauna survey site are shown in Figure 7.3.

Table 7.1: Summary of fauna survey effort

Survey technique	Survey effort				Target fauna species
	2017 post-wet season	2017 dry season	2020 surveys	Total	
Elliott traps	200 trap nights	200 trap nights	—	400 trap nights	Small mammals, some reptiles
Pitfall traps	32 trap nights	32 trap nights	—	64 trap nights	Small mammals, reptiles and frogs
Funnel traps	48 trap nights	48 trap nights	—	96 trap nights	Small mammals, reptiles and frogs
Spotlighting (on foot)	8 person hours on foot	7 person hours on foot	18 person hours on foot	33 person hours on foot	Mammals, reptiles, nocturnal birds
Call playback	3 sessions	3 sessions	12 sessions	18 sessions	Nocturnal birds, and Koalas
Infrared cameras	8 trap nights for cameras at systematic trap sites	8 trap nights for cameras at systematic trap sites	—	16 trap nights	Medium to large mammals and reptiles
Bird survey	13 person hours	14 person hours	10 person hours	37 person hours	Birds
Active searching	5 person hours	6 person hours	9.5 person hours	20.5 person hours	All conservation significant species, including mammals, reptiles and birds
Bat recorder (Anabat)	6 nights	5 nights	8 nights	19 nights	Bats
Koala Spot Assessment Technique (SAT) Surveys	4 sites	N/A	31 sites	35 sites	Koalas
Opportunistic/incidental bird survey	72 diurnal person hours	72 diurnal person hours	138 diurnal person hours	282 diurnal person hours	Birds, macropods, medium to large reptiles
	24 nocturnal person hours	24 nocturnal person hours	56 nocturnal person hours	104 nocturnal person hours	



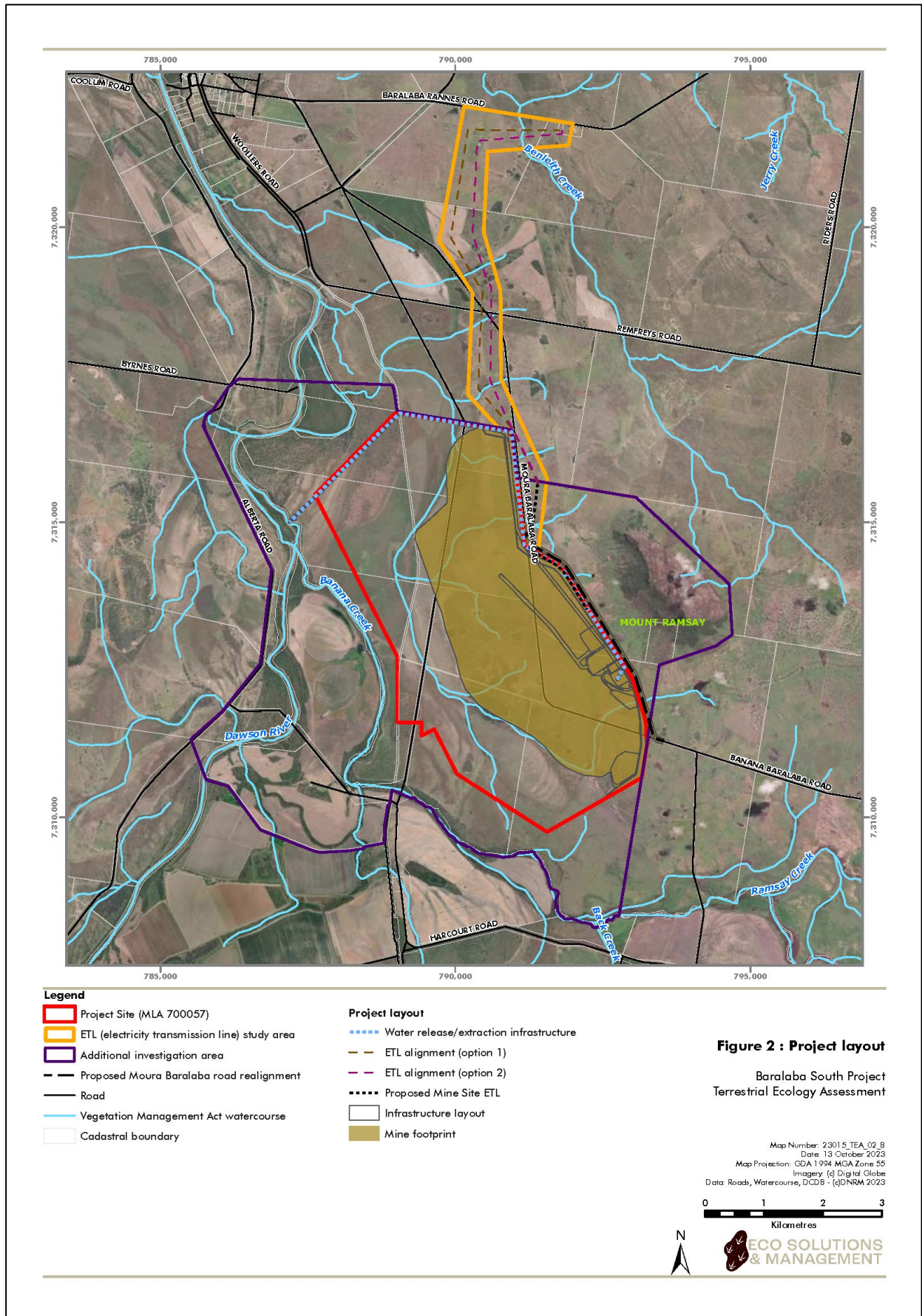


Figure 7.1: Terrestrial ecology study area



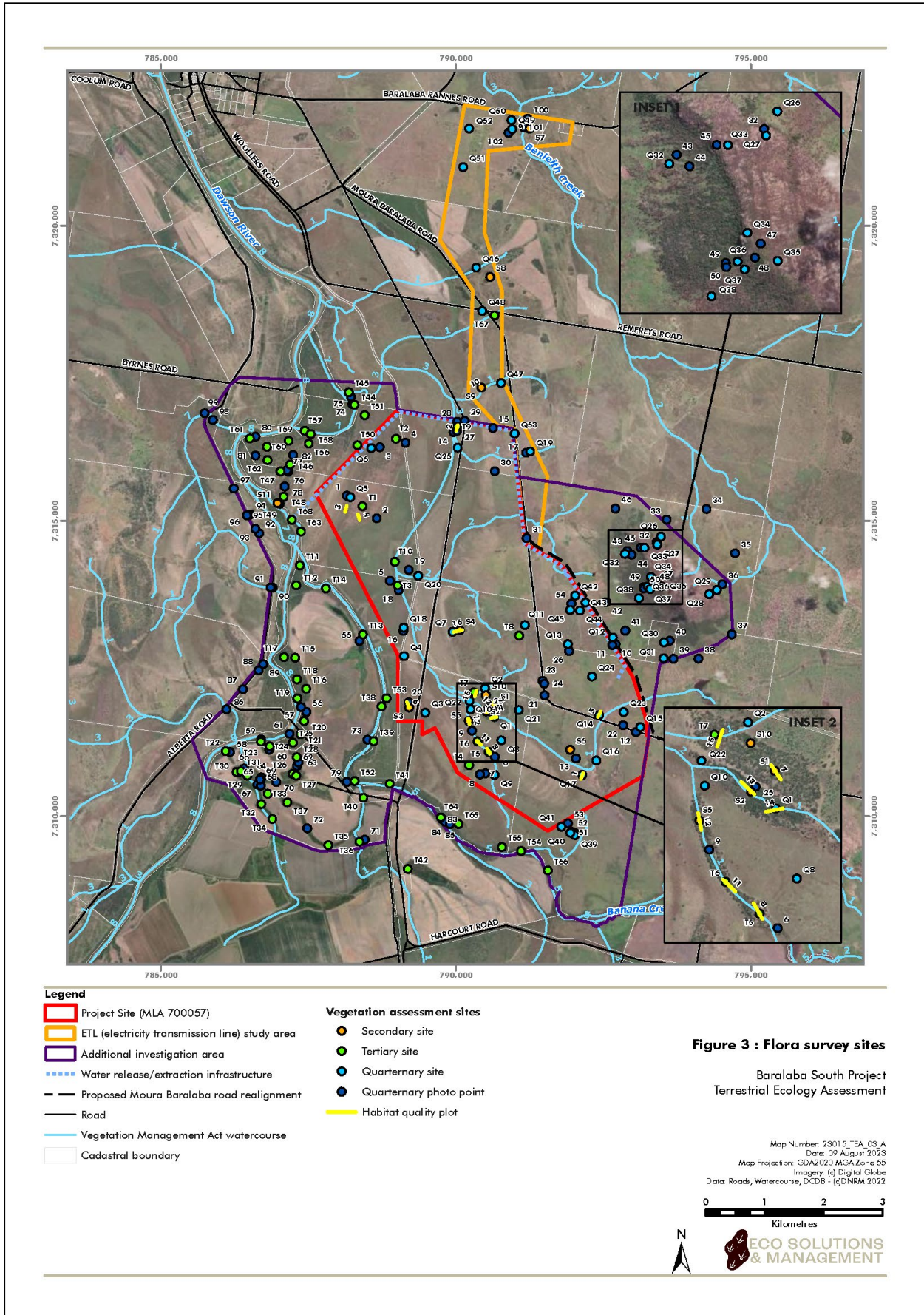


Figure 7.2: Flora survey sites



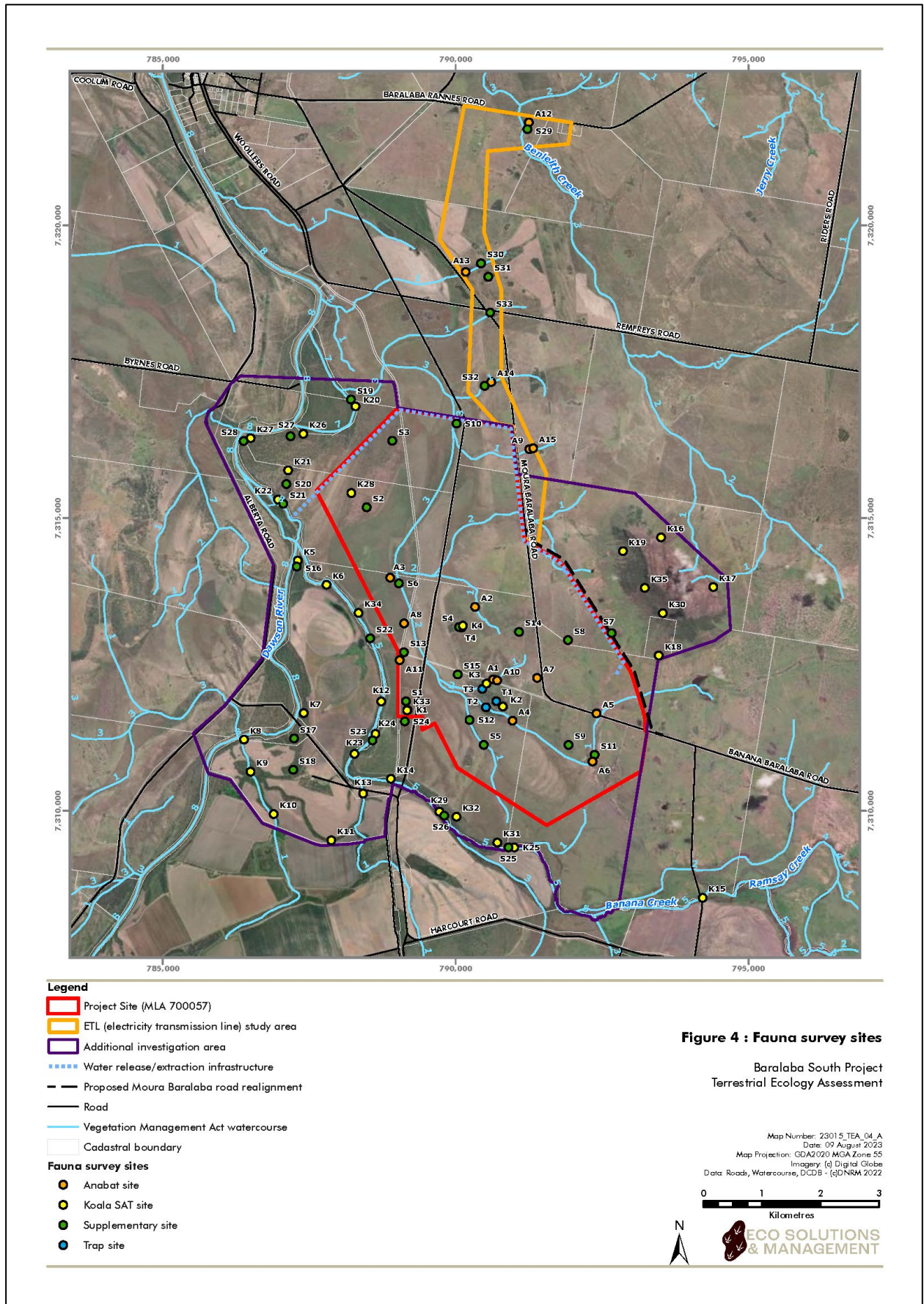


Figure 7.3: Fauna survey sites

### 7.3.2 Aquatic ecology

To describe the biodiversity and natural environmental values of the Project, an aquatic ecology assessment has been undertaken by ESP (Appendix G, Aquatic Ecology Assessment).

#### 7.3.2.1 Study area

The aquatic ecology study area for the Project comprises:

- the Project site (MLA 700057);
- the water release/extraction infrastructure and water pump station areas;
- the realignment area of the Moura-Baralaba Road; and
- the ETL study area (incorporating two ETL alignment options).

The aquatic ecology study area also includes the regional waterways and wetlands surrounding the Project (adjacent to, upstream and downstream) that were surveyed by ESP as part of the assessment (Figure 7.4).

Although surveys did not include sites in waterways bisected by the proposed Moura-Baralaba Road realignment, these waterways are tributaries of the unnamed drainage feature within the Project area and the surveys completed are considered representative of the waterways crossed by the road realignment.

#### 7.3.2.2 Desktop assessment

A desktop assessment was undertaken to identify potential aquatic ecosystem values within the aquatic ecology study area. The desktop assessment included a review of Commonwealth and State databases and mapping, literature reviews and completed ecology assessments from nearby locations. Database searches were undertaken within a 50 km of the boundary of the Project area. The results of the desktop assessment and database searches (described in Appendix G, Aquatic Ecology Assessment) informed the field survey design and methodology.

#### 7.3.2.3 Field survey

Two seasonal aquatic ecology surveys have been completed by suitably qualified ecologists in accordance with all required permits and approvals: one dry season survey (5 – 9 June 2017) and one wet season survey (13 – 19 March 2018).

The field assessment was conducted in accordance with following guidance material:

- 'Model Water Conditions for Coal Mines in the Fitzroy Basin' (DES, 2013);
- 'Monitoring and Sampling Manual: Environmental Protection (Water) Policy' (DES, 2018c);
- 'Environmental Protection (Water) Policy 2009 Dawson River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Dawson River Sub-basin except the Callide Creek Catchment' (DEHP, 2011);
- 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality' (ANZG, 2018);
- 'Queensland Australian River Assessment System (AusRivAS) Sampling and Processing Manual' (DNRM, 2001);
- 'Survey guidelines for Australia's threatened reptiles' (SEWPaC, 2011a);
- SPRAT Database (DoEE, 2019b-g) profiles for relevant EPBC Act listed species; and
- 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre *et al.*, 2018).

Surveys were undertaken at ten sites located on the Dawson River, Banana Creek, Shirley’s Gully, minor unnamed waterways/drainage lines and mapped wetlands within the MLA (Figure 7.4).

A summary of the aquatic ecology survey effort for each survey method used is provided in Table 7.2 and a summary of the survey locations and ecological indicators assessed at each location is provided in Table 7.3.

A supplementary site inspection was completed in August 2023 to verify the validity of the baseline survey results and to ground truth the location and characteristics of waterways to be disturbed by the Project.

Full details of field methodology and laboratory analyses are provided in Appendix G, Aquatic Ecology Assessment.

Table 7.2: Summary of aquatic ecology survey effort

Location	Survey effort			Targeted fauna
	2017 dry season	2018 post-wet season	Total	
Boat e-fisher	3 sites 48 minutes	4 sites 57.5 minutes	1.76 hours	Turtles and fish
Fyke net	5 sites 117.5 minutes	4 sites 125 minutes	242.5 hours	Turtles and fish
Box traps	5 sites 206.25 hours	4 sites 85 hours	291.25 hours	Turtles and fish
Seine nets	1 sweep	N/A	1 sweep	Turtles and fish
Spot lighting	N/A	4 sites 13 hours	13 hours	Turtles, fish and Platypus
Day time searching	Continuous	Continuous	Continuous	Turtles, fish and Platypus
Macroinvertebrate sampling	5 site samples	4 site samples	9 samples	Macroinvertebrates including Macrocrustaceans

Table 7.3: Aquatic ecology survey site locations, names, coordinates and ecological indicators assessed

Location	Site	Latitude	Longitude	June 2017						March 2018					
				Aquatic habitat	Water quality	Sediment quality	Aquatic plants	Fish & turtles	Macro invertebrates	Aquatic habitat	Water quality	Sediment quality	Aquatic plants	Fish & turtles	Macro invertebrates
<b>Downstream of the Project area</b>															
Dawson River	DR1	-24.2022°	149.8139°												
Dawson River Anabranh	DA1	-24.2337°	149.8383°												
Shirley's Gully	SG1	-24.2306°	149.8428°												
<b>Within the Project area</b>															
Unnamed waterway tributary	UW1T	-24.2604°	149.8451°												
Unnamed waterway	UW2	-24.2555°	149.8548°												
Lacustrine wetland	LW1	-24.2652°	149.8599°												
Palustrine wetland	PW1	-24.2806°	149.8494°												
	PW2	-24.2795°	149.8614°												
<b>Upstream/adjacent to the Project area</b>															
Banana Creek	BC1	-24.3093°	149.8981°												
	BC2	-24.2919°	149.8462°												

**Note:** Blue cells indicate ecological indicator was assessed at this site.

White cells indicate ecological indicator was not surveyed as the particular indicator was not present during inspection.

Red cells indicate ecological indicator was not assessed at this site due to suitable habitat not being present at this site.



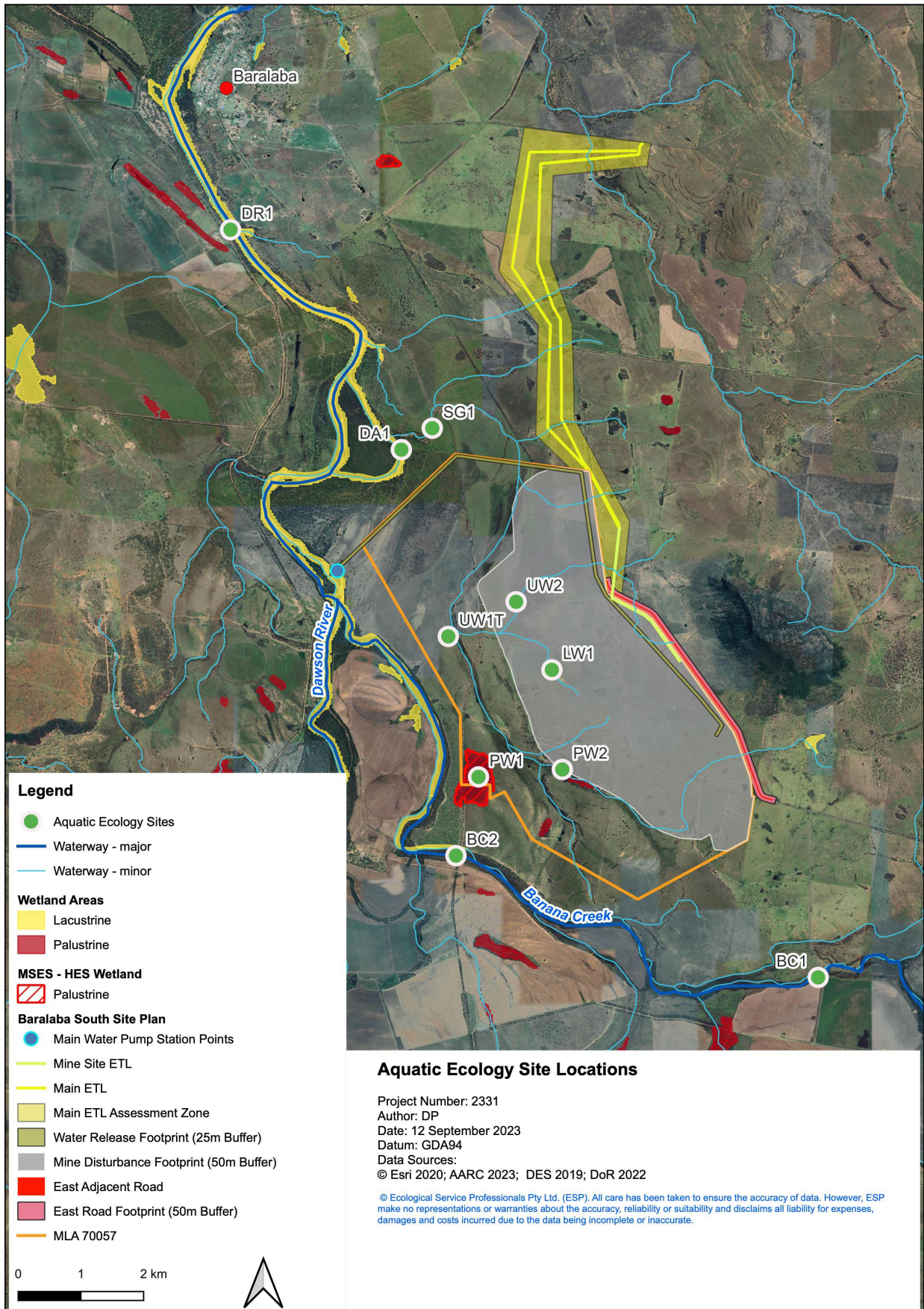


Figure 7.4: Aquatic ecology survey sites

### 7.3.3 Groundwater dependent ecosystems

A Groundwater Dependent Ecosystem Assessment was undertaken by 3D Environmental (Appendix H, Groundwater Dependent Ecosystem Assessment) to assess and describe groundwater dependent ecosystems (GDEs) within the study area.

#### 7.3.3.1 Study area

The GDE study area for the Project comprises the Project site (MLA 700057) and surrounds where GDEs have the potential to occur such as nearby waterways, wetlands and the floodplain of the Dawson River and where the Project has the potential to impact on GDEs.

#### 7.3.3.2 Desktop assessment

A desktop assessment has been undertaken comprising a review of government databases, literature and the Terrestrial Ecology Assessment (Appendix F, Terrestrial Ecology Assessment) and Groundwater Modelling and Assessment (Appendix B, Ground Water Modelling and Assessment) completed for the Project. A summary of the groundwater values associated with the Project is provided in Chapter 5, Groundwater.

The potential GDEs, identified through the desktop assessment within the study area were included in the field survey design. Further details regarding the desktop assessment are provided in Appendix H, Groundwater Dependent Ecosystem Assessment.

#### 7.3.3.3 Field survey

A field survey of GDEs was completed between 10 and 14 August 2020 by 3D Environmental (2023).

The field assessments were conducted in a manner that is consistent with 'Field Investigations of Potential Terrestrial Groundwater Dependent Ecosystems within Australia's Great Artesian Basin' (Jones *et al.*, 2020) and additional methodologies were derived from:

- 'Australian groundwater dependent ecosystem toolbox part 1: assessment framework' (Richardson *et al.*, 2011);
- 'Information Guidelines Explanatory Note – Assessing groundwater dependent ecosystems' (IESC, 2018); and
- 'Identifying groundwater dependent ecosystems – A guide for land and water managers' (Eamus, 2009).

In total, 13 sites (Figure 7.5), selected to provide representative coverage of the major vegetation types and landform elements that are most likely to be groundwater dependent, were assessed or inspected during the GDE field survey, including:

- eight sites in areas mapped as potential GDEs in the Groundwater Dependent Ecosystem Atlas (GDE Atlas) (BOM, 2020);
- three sites in areas of woody vegetation associated with overflow drainage channels and depressions;
- one site in the HES wetland within the Project area; and
- one inspection site on the western side of Mount Ramsay (was not targeted for biophysical or stable isotope sampling due to lack of any evidence for potential groundwater utilisation).

Field survey methods included assessment of key parameters used to determine the dependence of a particular vegetation community on groundwater: leaf water potential, soil moisture potential and analysis of stable isotope composition.

Full details of field methodology and laboratory analyses are provided in Appendix H, Groundwater Dependent Ecosystem Assessment.



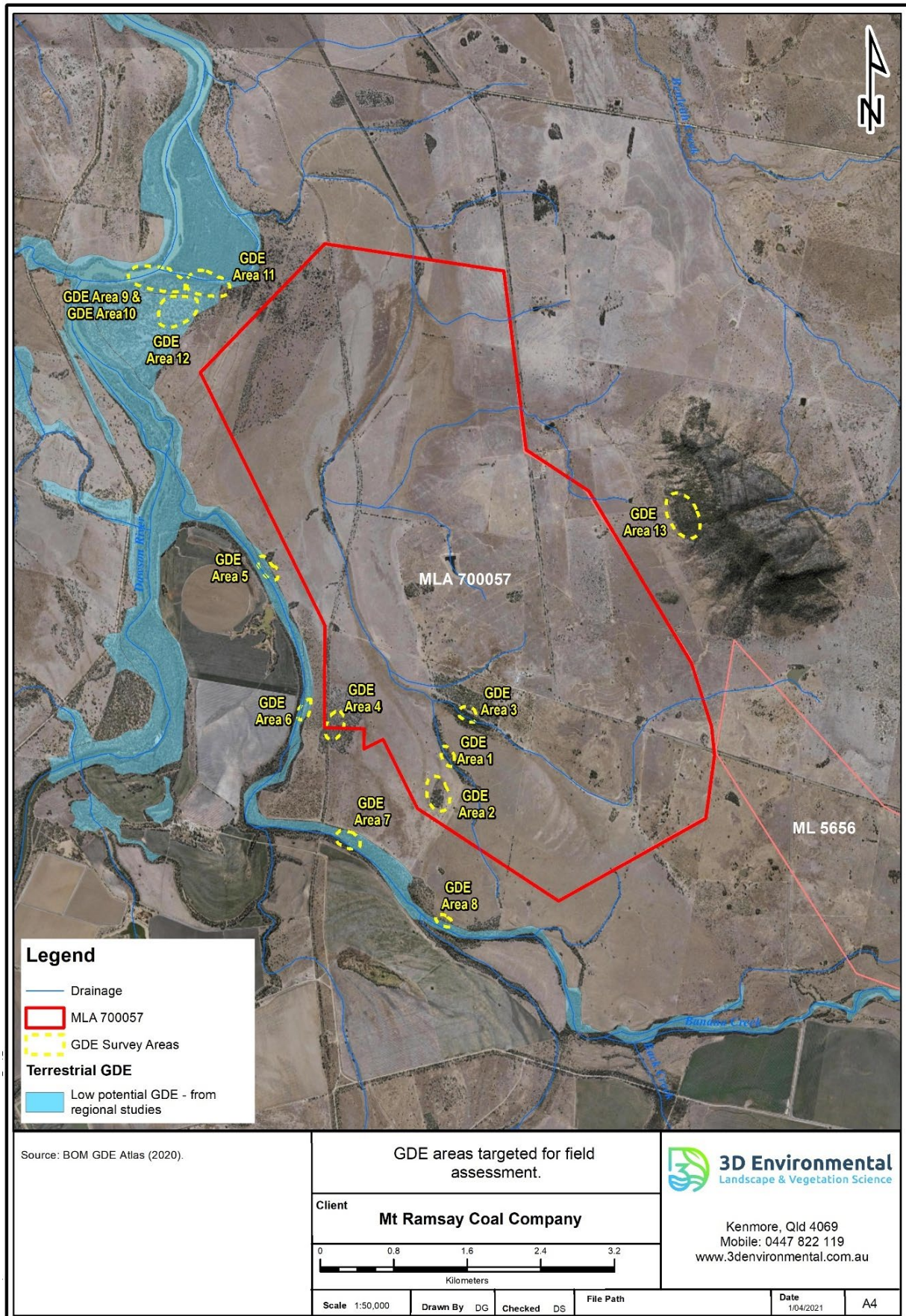


Figure 7.5: GDE assessment areas targeted for field assessment



### 7.3.4 Stygofauna

An assessment of stygofauna ecology values was undertaken by Stygoecologia (Appendix I, Stygofauna Assessment) to identify the presence and biodiversity of stygofauna in the Project area.

#### 7.3.4.1 Study area

The stygofauna study area encompassed the Project area and surrounding lands, with sampling of aquifers adjacent to the Dawson River and Banana Creek.

#### 7.3.4.2 Desktop assessment

A desktop assessment was used to determine the suitability of groundwater ecosystems of the Project area to provide habitat for stygofauna on the basis of geological, hydrological and water quality characteristics of local groundwater ecosystems, and included:

- A review of previous stygofauna studies conducted in the vicinity of the Project to determine the recorded presence and distribution of stygofauna in the region; in particular, the stygofauna assessments completed for the Project area in 2012 (SKM, 2013) and the Baralaba North Coal Mine in 2014 (Eco Logical, 2014), located approximately 10 km north in the alluvial aquifer of the Dawson River Anabranch.
- A review of groundwater quality (pH and EC) data within and surrounding the Project area (Appendix B, Groundwater Modelling and Assessment).
- A review of hydrological data for the Project (Appendix A, Surface Water Impact Assessment).

The hydrogeology and surface water quality of the Project area are described in Chapter 4, Surface Water and Chapter 5, Groundwater.

#### 7.3.4.3 Field survey

Four sampling surveys for stygofauna were undertaken for the Project across 12 groundwater bore sampling sites (Stygoecologia, 2019) (Table 7.4 and Figure 7.6).

The sample sites were selected as representatives of each of the major habitats of groundwater systems and aquifers and considered the south-west flow of shallow groundwater allowing for sites sampled to be located within, adjacent to, upstream and downstream of the Project area and selected based on suitability for stygofauna because:

- they were shallow monitoring piezometers of less than 100 m; and
- they accessed groundwater situated in the unconsolidated alluvial sediments.

The stygofauna assessment was undertaken in accordance with the Risk Assessment Guidelines for Groundwater Dependent Ecosystems" (Serov *et al.*, 2012) which fulfills the requirements of the 'Guideline for the Environmental Assessment of Subterranean Aquatic Fauna' (DSITIA, 2014). An ecological valuation of the aquifers and associated GDEs was undertaken in accordance with the 'Risk Assessment Guidelines for Groundwater Dependent Ecosystems', (Serov *et al.*, 2012) to determine the value of each aquifer and GDE and level of dependency on groundwater.

Full details of field methodology and laboratory analyses are provided in Appendix I, Stygofauna Assessment.

Table 7.4: *Stygofauna assessment sites*

Stygofauna sampling site	Aquifer unit	Altitude (mAHD)	Total depth (m)
<b>Within Project area</b>			
A-OB3	Quaternary alluvium	87.9	30
A-OB4	Quaternary alluvium	87.5	17
A-OB10	Quaternary alluvium	87.5	23
<b>Adjacent to Project area</b>			
A-PB1	Quaternary alluvium	88.4	22.3
A-PB2	Quaternary alluvium	88.9	29.1
A-OB1	Quaternary alluvium	88.9	29.1
A-OB2	Quaternary alluvium	88.3	20
A-OB6	Quaternary alluvium	91.4	29
A-OB7	Quaternary alluvium	91.7	26
A-OB8	Quaternary alluvium	91.4	23
A-OB11	Quaternary alluvium	86.2	17
A-OB12	Quaternary alluvium	87.2	18

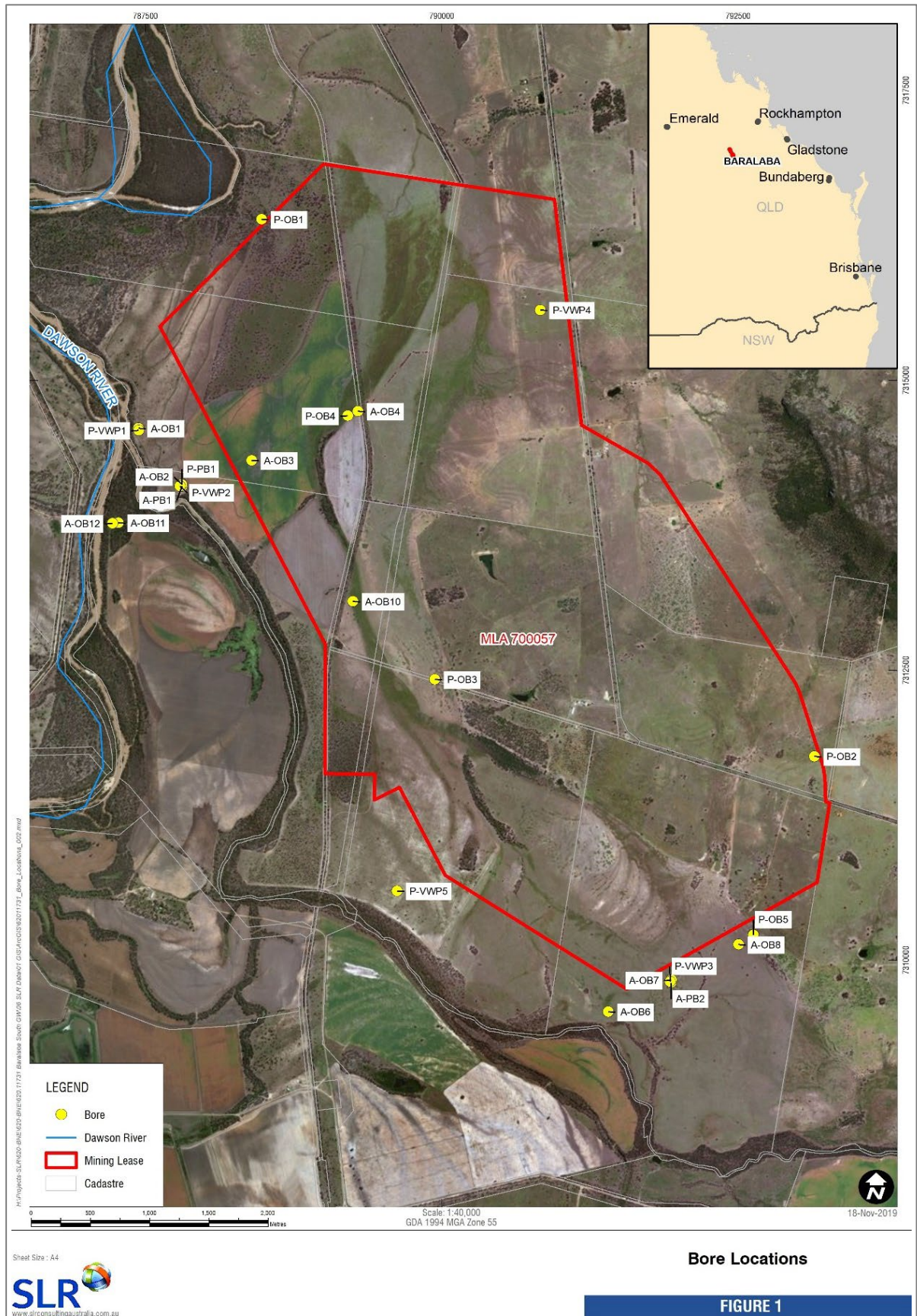


Figure 7.6: Bore locations within and around the Project area

## 7.4 Terrestrial ecological values

This section outlines the terrestrial ecology values identified through the terrestrial ecology assessment. It is intended to provide sufficient information for the basis of the impact assessments completed in later sections and other chapters.

### 7.4.1 Regional ecosystems

Remnant and regrowth vegetation mapping for the terrestrial ecology study area is shown on Figure 7.7. The REs identified during field surveys are summarised in Table 7.5 and further descriptions are available in Appendix F, Terrestrial Ecology Assessment.

Most of the Project area and ETL study area has been cleared of remnant and regrowth vegetation. A total area of 26.4 ha of remnant vegetation occurs in the Project area. The additional investigation area supports larger continuous patches of remnant vegetation, both along the Dawson River, Banana Creek and Mount Ramsay, however, significant areas within the additional investigation area have been cleared for agricultural purposes.

Queensland Government (Version 11.0) RE mapping identifies one area of remnant vegetation in the central southern portion of the Project site. The mapping indicates the area to be:

- RE 11.4.2 – *Eucalyptus spp.* and/or *Corymbia spp.* grassy or shrubby woodland on Cainozoic clay plains (of concern- VM Act, of concern biodiversity status); and
- RE 11.4.1 – Semi-evergreen vine thicket +/- *Casuarina cristata* on Cainozoic clay plains (endangered- VM Act, endangered biodiversity status).

Field validated mapping of the remnant vegetation in the Project area was inconsistent with the Queensland Government mapping, and neither of the two mapped REs were recorded on the site. Two different REs are considered to occur:

- 1) RE 11.5.9 – *Eucalyptus crebra* and other *Eucalyptus spp.* and *Corymbia spp.* woodland on Cainozoic sand plains and/or remnant surfaces; and
- 2) RE 11.5.15 - Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces.

A patch of woodland (RE 11.3.3 *Eucalyptus coolabah* woodland on alluvial plains) was also recorded in the south-western corner of the Project area and it extended south into the additional investigation area. Although government mapping indicates this is regrowth vegetation, data collected in the field indicates this patch has the height and cover requirements to be mapped as remnant vegetation. RE 11.3.3 is recognised as a floodplain wetland, vegetation management wetland and HES wetland by the Queensland Government. The mapped boundaries differ slightly to the field validated remnant RE mapping (Figure 7.7, Figure 7.19).

Vegetation that was representative of high-value regrowth RE 11.3.3a was recorded to the south of the patch of remnant eucalypt woodland (RE 11.5.9). This community was moderately to highly fragmented by historic clearing and was associated with a drainage basin that holds water for extended periods.

Several additional small patches of regrowth vegetation are scattered throughout the Project area and ETL study area and correspond with REs 11.3.1, 11.3.3, 11.4.8, 11.4.9a and 11.5.15 (Table 7.5). These patches are too small to be considered mappable entities in accordance with the 'Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland V 5.1' (Neldner *et al.*, 2020). Nonetheless some of these patches may contribute to habitat for significant species or TECs and have been included in mapping for protected matters where relevant.

The additional investigation area supports larger continuous patches of remnant vegetation, both along the Dawson River, Banana Creek and Mount Ramsay, however, significant areas within the additional investigation area have also been cleared for agricultural purposes.



The remnant and regrowth vegetation associated with the Dawson River and Banana Creek in the additional investigation area, was found to generally align with the Queensland Government remnant mapping and consist predominantly of RE 11.3.3 - *Eucalyptus coolabah* woodland on alluvial plains.

Vegetation on Mount Ramsay comprised different regional ecosystems to that mapped by the Queensland Government. The vegetation on Mount Ramsay includes a large area of vegetation that does not currently align with an RE listed in the REDD (Queensland Herbarium, 2019). Remnant REs on Mount Ramsay include:

- RE 11.7.2x3–*Acacia rhodoxylon* tall shrubland to scrub on Cretaceous igneous rocks;
- 11.9.1–*E. cambageana* woodland to open forest with *Acacia harpophylla* on fine-grained sedimentary rocks;
- 11.12.1–*E. crebra* woodland on igneous rocks; and
- 11.12.4a–Semi-evergreen vine thicket with open patches of *A. fasciculifera*, *Archidendropsis thozetiana*, *Pleigynium timorense* and various other species.

Table 7.5: Field validated remnant and high-value regrowth REs, terrestrial ecology study area

RE code	Short descriptions (Queensland Herbarium, 2019)	VM Act status	Biodiversity status	EPBC Act status	Remnant (high-value regrowth) area (ha)
<b>Project site</b>					
11.3.3/a	<i>Eucalyptus coolabah</i> woodland on alluvial plains	Of concern	Of concern	Endangered – Portions of vegetation within the Project area represent the Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions TEC	16.6 (45.9)
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces	Least concern	No concern at present	Not listed	8.7 (5.3)
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces	Least concern	Endangered	Not listed - Vegetation within the Project area does not represent the Semi-evergreen Vine thicket TEC	1.1 (0.0)
<b>Water release/extraction infrastructure</b>					
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Least concern	No concern at present	Not listed	0.1 (0.0)
<b>ETL study area</b>					
11.4.9a	<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open forest to woodland	Endangered	Endangered	Endangered – Patches of this RE represent the Brigalow ( <i>Acacia harpophylla</i> dominant and codominant) TEC	0.0 (7.6)

RE code	Short descriptions (Queensland Herbarium, 2019)	VM Act status	Biodiversity status	EPBC Act status	Remnant (high-value regrowth) area (ha)
<b>Additional investigation area</b>					
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Endangered	Endangered	Endangered – Patches of this RE represent the Brigalow ( <i>Acacia harpophylla</i> dominant and codominant) TEC	23.5 (1.5)
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	Of concern	Of concern	Endangered – a number of patches potentially contribute to the Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions TEC	344.6 (71.7)
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	Of concern	Of concern	Not listed	15.5 (0.0)
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Least concern	No concern at present	Not listed	286.5 (0.0)
11.3.27	Freshwater wetlands	Least concern	Of concern	Not listed	7.9 (0.0)
11.7.2x3 <sup>1</sup>	<i>Acacia rhodoxylon</i> tall shrubland to scrub on Cretaceous igneous rocks	Least concern	No concern at present	Not listed	107.0 (0.0)
11.9.1	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> on fine-grained sedimentary rocks	Endangered	Endangered	Not listed - Vegetation within the additional investigation area does not represent the Brigalow ( <i>Acacia harpophylla</i> dominant and codominant) TEC	5.7 (0.0)
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks	Least concern	No concern at present	Not listed	81.2 (0.0)
11.12.4a	Semi-evergreen vine thicket with open patches of <i>Acacia fasciculifera</i> , <i>Archidendropsis thozetiana</i> , <i>Pleignium timorense</i> and various other species	Least concern	No concern at present	Not listed	96.5 (0.0)

Note: <sup>1</sup> This RE does not currently align with a RE listed in the REDD (Queensland Herbarium, 2019) and has been recommended by the Brigalow Belt Bioregion mapping coordinator (Queensland Herbarium) as an interim descriptor for the corresponding vegetation that was recorded on Mount Ramsay.

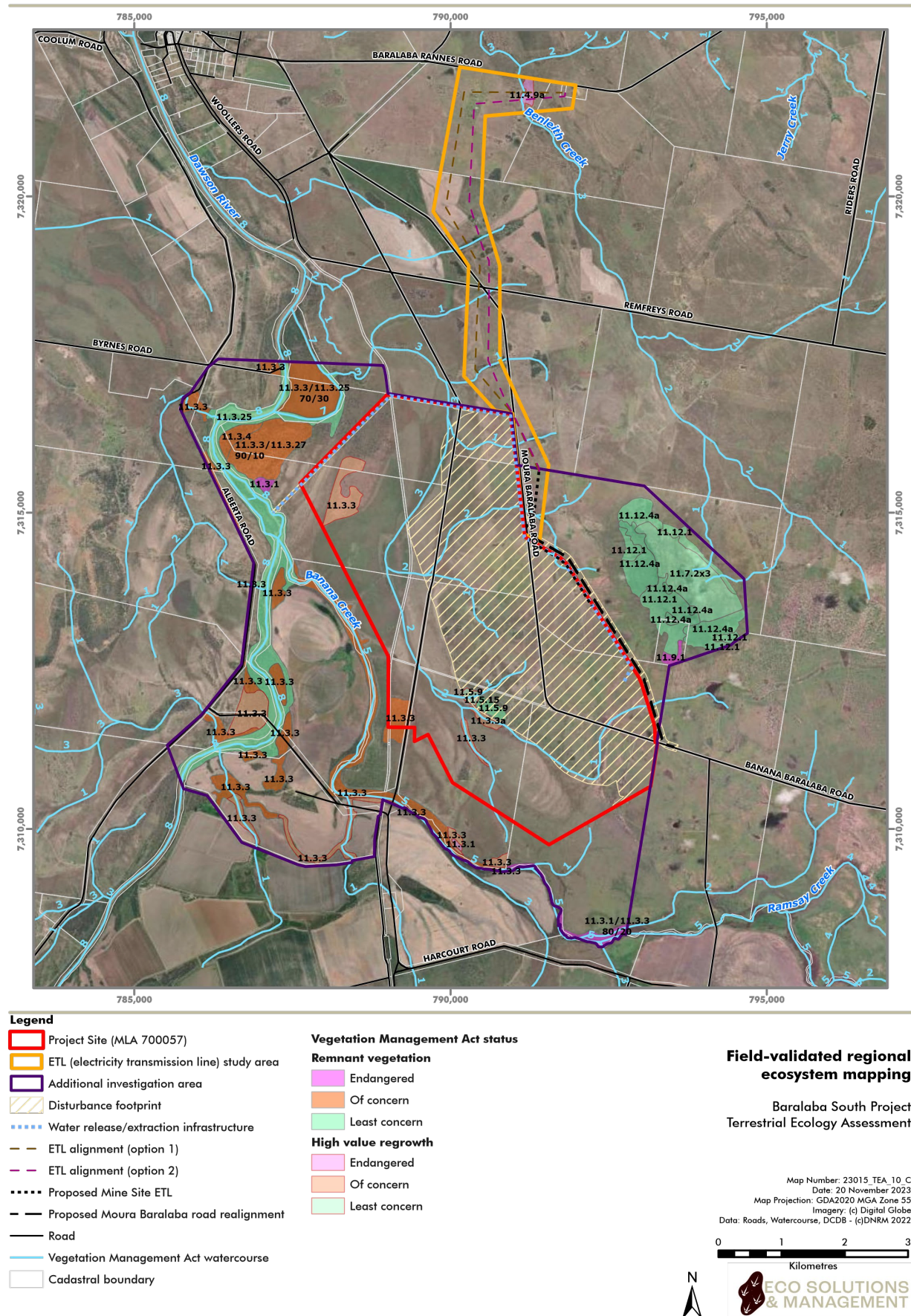


Figure 7.7: Field validated regional ecosystem mapping within the terrestrial ecology study area



## 7.4.2 Threatened ecological communities

Four TECs defined under the EPBC Act were identified through database searches as potentially occurring within the terrestrial ecology study area. Field surveys identified two TECs present within the terrestrial ecology study area, namely:

- 1) Brigalow (*Acacia harpophylla* dominant and codominant) (Brigalow TEC); and
- 2) Coolibah–Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Coolibah TEC).

Both communities are listed as endangered under the EPBC Act.

A summary of the two TECs that occur within the terrestrial ecology study area is provided below and the spatial extent and distribution of the field validated TECs is illustrated in Figure 7.8.

### 7.4.2.1 Brigalow (*Acacia harpophylla* dominant and codominant) threatened ecological community

Areas of Brigalow (*Acacia harpophylla*) vegetation were recorded within the terrestrial ecology study area and many of these patches exhibited the key diagnostic features and condition thresholds of the EPBC Act listed endangered Brigalow TEC.

Four small patches of Brigalow TEC have been mapped within the Project area and two small patches have been mapped within the ETL study area. These patches are comprised of vegetation representing RE 11.3.1 and RE 11.4.9a and are shown on Figure 7.8. None of the Brigalow patches in the Project site and one within the ETL study area are large enough to be considered a mappable entity under the VM Act and as such are not shown on Figure 7.7. The condition of these patches was considered to be low due to their high use by cattle as cattle camps.

A total of 43.5 ha of Brigalow TEC has been identified in the terrestrial ecology study area, including 4.1 ha within the Project area and 9.9 ha in the ETL study area (Figure 7.8).

### 7.4.2.2 Coolibah–Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions threatened ecological community

Three patches of Coolibah (*Eucalyptus coolabah*) dominated woodland vegetation (RE 11.3.3) were found to satisfy the listing criteria for the Coolibah TEC in the Project area. A total of 55.8 ha of Coolibah woodland meet the diagnostic criteria and condition thresholds stipulated in the DCCEEW's listing advice for the TEC (TSSC, 2011) and have been mapped within the Project site (Figure 7.8). A detailed evaluation of how these patches meet the diagnostic criteria and condition thresholds for the Coolibah TEC is provided in Appendix F, Terrestrial Ecology Assessment.

Although not specifically assessed for TEC status, patches of vegetation consisting of RE 11.3.3 along the Dawson River, Banana Creek and their tributaries could also meet the diagnostic criteria and condition thresholds for the Coolibah TEC. These patches consist of approximately 428.7 ha, however, none of these patches will be disturbed by the Project. As such, the Coolibah TEC will not be considered further.

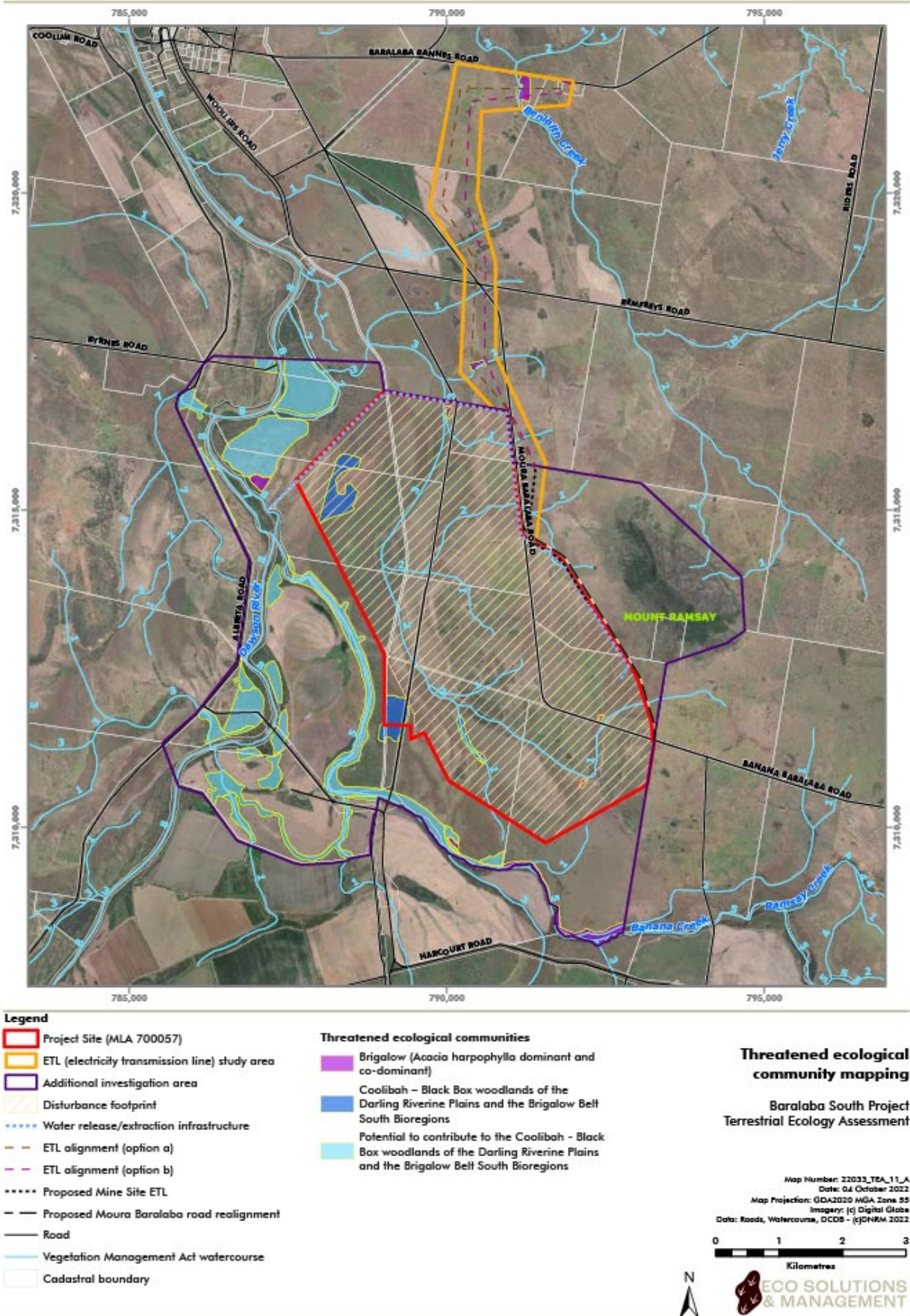


Figure 7.8: Field validated TEC within the terrestrial ecology survey area

### 7.4.3 Flora species of conservation significance

A total of 362 terrestrial flora species have been recorded in the terrestrial ecology study area representing 87 families and 234 genera. The species inventory included 56 introduced species. A full list of the flora species recorded during the field surveys is presented in Appendix F, Terrestrial Ecology Assessment.

Database searches returned 13 threatened species listed under the EPBC Act and/or the NC Act as potentially occurring within 25 km of the Project area (Table 7.6). A summary of each listed species identified in database searches, including likelihood of occurrence, is presented in Table 7.6 and a detailed description, including species habitats and likelihood of occurrence, is provided in Appendix F, Terrestrial Ecology Assessment.

Two threatened flora species were recorded during flora surveys in the MLA:

- 1) *Xerothamnella herbacea* (endangered under both the EPBC Act and the NC Act); and
- 2) *Solanum elachophyllum* (endangered under the NC Act).

These species are discussed in further detail in sections 7.4.3.3 and 7.4.3.4.

#### 7.4.3.1 Protected plants flora survey trigger map

The protected plants flora survey trigger map identifies a high risk area in the central portion of the terrestrial ecology study area that is assumed to be attributable to *Xerothamnella herbacea* (no common name) and *Solanum elachophyllum* (no common name), which were both recorded in a patch of non-remnant RE 11.4.8 in the Project area in 2017. The high risk areas identified by the protected plants flora survey trigger map were included in flora surveys.

#### 7.4.3.2 Essential habitat

The remnant and regrowth vegetation located centrally within the Project area is also mapped as essential habitat for *Bertya pedicellata*. This essential habitat is reportedly based on a record for this species. However, this record is likely to be erroneous, as habitat is not suitable for this species at this location and two other threatened species (*Xerothamnella herbacea* and *Solanum elachophyllum*) have since been recorded at this location (EcoSM, 2021).

Table 7.6: Flora species of conservation significance identified in database searches

Scientific name	Common name	EPBC Act status	NC Act status	Likelihood of occurrence	Survey presence
<i>Arthraxon hispidus</i>	Hairy-joint Grass	V	V	Low	—
<i>Bertya opposens</i>	—	V	LC	Low	—
<i>Bertya pedicellata</i>	—	—	NT	Low	—
<i>Cadellia pentastylis</i>	Ooline	V	V	Low	—
<i>Cossinia australiana</i>	Cossinia	E	E	Low	—
<i>Cycas megacarpa</i>	—				
<i>Dichanthium queenslandicum</i> <sup>1</sup>	King Bluegrass	E	V	Low	—
<i>Dichanthium setosum</i>	—	V	LC	Low	—
<i>Solanum dissectum</i> <sup>2</sup>	—	E	E	Low	—
<i>Solanum elachophyllum</i>	—	—	E	Known	Present
<i>Solanum johnsonianum</i> <sup>2</sup>	—	E	E	Low	—
<i>Xerothamnella herbacea</i>	—	E	E	Known	Present

Blue cells indicate species recorded in the terrestrial ecology study area.

E = endangered

V = vulnerable

NT = near threatened

<sup>1</sup> King Bluegrass was listed as vulnerable under the EPBC Act at the time of the EPBC Act Controlled Action Decision (EPBC Referral 2012/6547), and has since been transferred to the endangered category, as such this species is considered a relevant MNES for the Project.

<sup>2</sup> At the time of the EPBC Act Controlled Action Decision (EPBC Referral 2012/6547), *Solanum dissectum* and *Solanum johnsonianum* were not listed as a threatened flora species under the EPBC Act and therefore are not considered as MNES for the Project.

#### 7.4.3.3 Xerothamnella herbacea

*Xerothamnella herbacea* is listed as endangered under both the EPBC Act and the NC Act. This species occurs in Brigalow dominated communities in shaded situations, often in leaf litter and is often associated with gilgais (shallow ground depressions). Soils are generally heavy, grey to dark brown clays (TSSC, 2008a).

*X. herbacea* has been recorded in ten locations within a fragmented and considerably degraded patch of non-remnant Dawson River Gum (*Eucalyptus cambageana*) scrubby open woodland (RE 11.4.8) in the central-eastern portion of the Project area (Figure 7.9). This species was recorded during the late dry season survey (December 2017) following moderate rainfall delivered during spring storms. The number of individuals present at each location was low, ranging from 1 to 20 individuals, totalling approximately 90 specimens recorded.

The woodland community in which the species was detected was markedly fragmented with dead stags common throughout the canopy layer. Cattle grazing was prevalent and an ongoing disturbance throughout the Project area, resulting in fragmentation of the shrub layer and weed infiltration throughout much of the ground layer. Some of the *X. herbacea* individuals recorded in the field had been grazed by cattle but appeared to be regenerating at the time of the surveys (EcoSM, 2021).



There is potential for a mixed community of RE 11.3.1/11.3.3 along Banana Creek in the south of the additional investigation area to support *X. herbacea* (Figure 7.7). This species was not recorded in this habitat despite extensive searches in this habitat area.

#### 7.4.3.4 *Solanum elachophyllum*

*Solanum elachophyllum* is listed as endangered under the NC Act. It is not listed under the EPBC Act.

*S. elachophyllum* is a perennial sub-shrub with underground rhizomes that can send up more or less shoots depending on seasonal conditions (Fensham *et al.*, 2017). The species grows on fertile cracking clay soils primarily in Brigalow habitats but has also been known to occur in vegetation types which include Napunyah (*Eucalyptus thozetiana*) woodland, Brigalow woodland to open forest with an understorey of Wilga (*Geijera parviflora*) and Belah (*Casuarina cristata*), Southern Bonewood (*Macropteranthes leichhardtii*) thicket, Dawson River Gum woodland with Narrow-leaved Ironbark (*Eucalyptus crebra*) and *E. tucaleyptus tenuipes* (Bean, 2004; CSIRO, 2016).

Two discreet populations of *Solanum elachophyllum* were recorded from within the Project area, one within the central-east portion of the study area and the other in the northern portion of the ETL study area.

*S. elachophyllum* has been recorded at three locations in the same patch of non-remnant Dawson River Gum woodland (RE 11.4.8) as *X. herbacea* (Figure 7.9). The approximate total count of individual specimens across the three locations was 89. During the additional survey undertaken in March 2018, an increase in numbers was recorded at each location, with an approximate total count of 117 individuals. The plants were found to be in good vigour despite the poor-quality habitat, whereby historic disturbance attributed to cattle grazing, and exotic groundcover was noticeable.

The ETL study area population was recorded in regrowth Brigalow woodland (RE 11.4.9a) (Figure 7.9). Approximately 42 individuals were counted across three sub-populations at this location, each occupying very small areas of between 1 and 10 m<sup>2</sup>. *S. elachophyllum* plants were found to be in poor vigour at the time of the survey in October 2020. This was most likely due to the dry conditions preceding the survey and trampling by cattle. This species was not recorded within other areas of similar habitat within the terrestrial ecology study area despite targeted surveys within these areas.

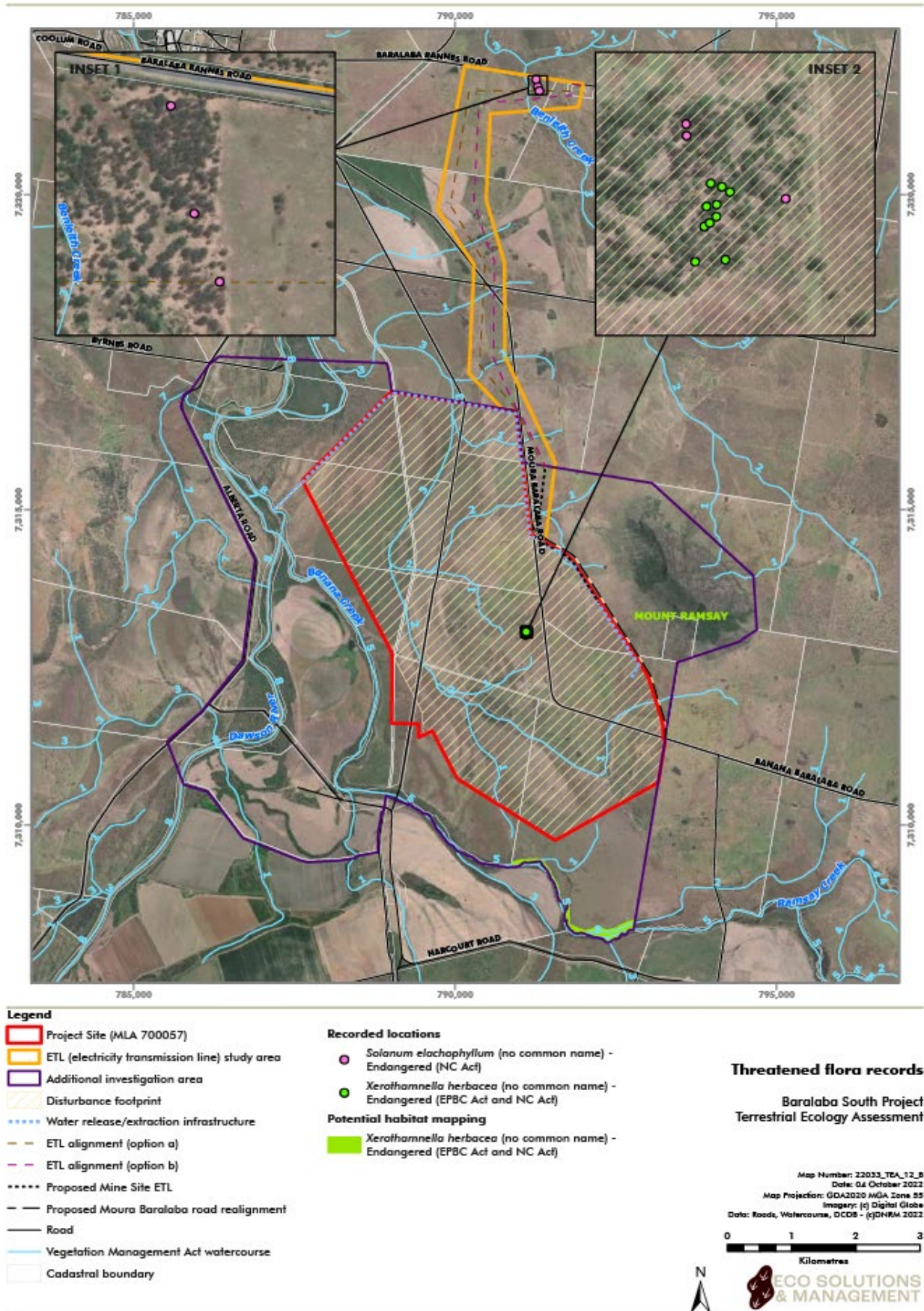


Figure 7.9: Threatened flora records within the terrestrial ecology study area

#### 7.4.4 Fauna species of conservation significance

A total of 193 species of terrestrial vertebrate fauna were recorded during the field surveys, including six introduced species. Native species richness included 13 amphibians, 17 reptiles, 129 birds and 28 mammals. A complete list of terrestrial fauna species recorded during the seasonal surveys is provided in Appendix F, Terrestrial Ecology Assessment.

Database searches returned 29 threatened fauna species listed under the EPBC Act and/or the NC Act as potentially present within 25 km of the Project, including six reptile, twelve bird, and ten mammal species (Table 7.7) including one special least concern (NC Act) species, the Short-beaked Echidna (*Tachyglossus aculeatus*).

Four fauna species of conservation significance were recorded within the terrestrial ecology study area. These were:

- 1) Ornamental Snake (*Denisonia maculata*) (vulnerable under the EPBC Act and the NC Act);
- 2) Squatter Pigeon (Southern) (*Geophaps scripta scripta*) (vulnerable under the EPBC Act and the NC Act);
- 3) Koala (*Phascolarctos cinereus*) (endangered under the EPBC Act and the NC Act); and
- 4) The Short-beaked Echidna (special least concern animal under the NC Act).

These species are discussed in further detail in the following sections.

A summary of the likelihood of occurrence and survey presence each threatened species returned in the database searches is presented in Table 7.7. A detailed description of those threatened species, including species habitats and likelihood of occurrence, is provided in Appendix F, Terrestrial Ecology Assessment.

Database searches returned 14 additional birds (i.e. those listed as migratory but not threatened) under the EPBC Act as potentially occurring within 25 km of the Project. No listed migratory species were recorded in the terrestrial ecology study area during the seasonal field surveys. However, two migratory species have been determined to have a moderate potential to occur in the Project area: Glossy Ibis (*Plegadis falcinellus*); and Latham's Snipe (*Gallinago hardwickii*).

A summary of the likelihood of occurrence and survey presence of each migratory species returned in the database searches is presented in Table 7.8. A description of the preferred habitat of migratory species returned in database searches and an assessment of their likelihood of occurrence within the terrestrial ecology study area is outlined in Appendix F, Terrestrial Ecology Assessment.

Table 7.7: Threatened and special least concern (non-migratory) fauna species identified in database searches

Species name	Common name	EPBC Act status	NC Act status	Likelihood of occurrence
<b>Reptiles</b>				
<i>Acanthophis antarcticus</i>	Common Death Adder	—	V	Low
<i>Delma torquata</i>	Collared Delma	V	V	Low
<i>Denisonia maculata</i>	Ornamental Snake	V	V	Known
<i>Egernia rugosa</i>	Yakka Skink	V	V	Low
<i>Furina dunmalli</i>	Dunmall's Snake	V	V	Low
<i>Hemiaspis damelii</i> <sup>A</sup>	Grey Snake	E	E	Low

Species name	Common name	EPBC Act status	NC Act status	Likelihood of occurrence
<b>Birds</b>				
<i>Calidris ferruginea</i> <sup>^</sup>	Curlew Sandpiper	CE, M	CE	Low
<i>Erythrotriorchis radiatus</i>	Red Goshawk	V	E	Low
<i>Falco hypoleucos</i> <sup>^</sup>	Grey Falcon	V	V	Low
<i>Calidris ferruginea</i> <sup>^</sup>	Curlew Sandpiper	CE/M	CE	Low
<i>Geophaps scripta scripta</i>	Squatter Pigeon (Southern)	V	V	Known
<i>Grantiella picta</i> <sup>^</sup>	Painted Honeyeater	V	V	Low
<i>Hirundapus caudacutus</i> <sup>^</sup>	White-throated Needletail	V, M	V	Moderate
<i>Neochmia ruficauda ruficauda</i>	Star Finch (Southern)	E	E	Low
<i>Numenius madagascariensis</i>	Eastern Curlew	CE	E	Low
<i>Poephila cincta cincta</i>	Southern Black-throated Finch	E	E	Low
<i>Rostratula australis</i> <sup>^</sup>	Australian Painted Snipe	E	V	Moderate
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V	Low
<i>Turnix melanogaster</i>	Black-breasted Buttonquail	V	V	Low
<b>Mammals</b>				
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Low
<i>Dasyurus hallucatus</i>	Northern Quoll	E	LC	Low
<i>Macroderma gigas</i> <sup>^</sup>	Ghost Bat	V	V	Low
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Low
<i>Petauroides armillatus</i> and <i>P. volans</i> <sup>^</sup>	Greater Glider (southern and central)	E	E	Moderate
<i>Phascolarctos cinereus</i>	Koala	E	E	Known
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	LC	Low
<i>Petaurus australis australis</i>	Yellow-bellied Glider (south-eastern)	V	E	Moderate
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	—	SLC	Known

Key: Blue cells indicate species identified in the study area during field surveys; CE = critically endangered; E = endangered; M = migratory; V = vulnerable; LC- Least concern, SLC = special least concern

<sup>^</sup> At the time of the EPBC Act Controlled Action Decision (EPBC Referral 2012/6547), the Grey Snake, Curlew Sandpiper, Painted Honeyeater, White-throated Needletail, Grey Falcon, Ghost Bat, Greater Glider (southern and central) and Yellow-bellied Glider were not listed as threatened under the EPBC Act and therefore are not considered as a listed threatened species MNES for the Project. The Australian Painted Snipe and Koala were listed as vulnerable under the EPBC Act at the time of the referral decision and have since been transferred to the endangered category, as such these species are still considered a relevant MNES for the Project.



Table 7.8: Migratory fauna species identified in database searches

Species name	Common name	EPBC Act status	NC Act status	Likelihood of occurrence
<i>Actitis hypoleucos</i>	Common Sandpiper	M	SLC	Low
<i>Apus pacificus</i>	Fork-tailed Swift	M	SLC	Low
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	SLC	Low
<i>Calidris ferruginea</i> <sup>^</sup>	Curlew Sandpiper	M	CR	Low
<i>Calidris melanotos</i>	Pectoral Sandpiper	M	SLC	Low
<i>Cuculus optatus</i>	Oriental Cuckoo	M	SLC	Low
<i>Gallinago hardwickii</i>	Latham's Snipe	M	SLC	Moderate
<i>Hirundapus caudacutus</i> <sup>^</sup>	White-throated Needletail	M	V	Low
<i>Monarcha trivirgatus</i>	Spectacled Monarch	M	SLC	Low
<i>Motacilla flava</i>	Yellow Wagtail	M	SLC	Low
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M	SLC	Low
<i>Pandion haliaetus</i>	Osprey	M	SLC	Low
<i>Plegadis falcinellus</i>	Glossy Ibis	M	SLC	Moderate
<i>Rhipidura rufifrons</i>	Rufous Fantail	M	SLC	Low
<i>Tringa stagnatilis</i>	Marsh Sandpiper	M	SLC	Low

Key: CE = critically endangered; CR= Critically endangered; E = endangered; M = migratory; V = vulnerable; SLC = special least concern

<sup>^</sup>The Curlew Sandpiper and White-throated Needletail were listed as migratory species at the time of the EPBC Act Controlled Action Decision (EPBC Referral 2012/6547), as such are still considered MNES in terms of migratory species.

#### 7.4.4.1 EPBC Act threatened species

Three species listed as threatened under the EPBC Act were recorded within the terrestrial ecology study area during field surveys, namely:

- 1) Ornamental Snake (vulnerable);
- 2) Koala (endangered, was listed as vulnerable under the EPBC Act at the time of the referral decision); and
- 3) Squatter Pigeon (Southern) (vulnerable).

One additional species listed as endangered, the Australian Painted Snipe, was considered to have a moderate likelihood of occurring within the terrestrial ecology study area. The species was listed as vulnerable under the EPBC Act at the time of the referral decision.

Details of habitat identified within the terrestrial ecology study area for each of these species is provided below. At the time of the EPBC Act Controlled Action Decision (EPBC Referral 2012/6547), a number of fauna species were not listed as threatened fauna under the EPBC Act and therefore are not considered as listed threatened species MNES for the Project. Where a species is listed as both threatened and migratory under the EPBC Act, it has been considered in this section and not section 7.4.4.2. Similarly, where a species is listed as

threatened under the EPBC Act and listed under the NC Act, it has been included in this section and not section 7.4.4.3.

### *Ornamental Snake*

The Ornamental Snake is listed as vulnerable under the EPBC Act and NC Act.

Two individuals of this species were detected during spotlighting sessions in non-remnant Coolibah with Brigalow woodland (RE 11.3.3) associated with a drainage line (stream order 1) in the south-western portion of the Project site (Figure 7.10). One individual was recorded at supplementary site 5 during the post-wet season survey, the other was recorded at supplementary site 12 during the dry season surveys.

The Ornamental Snake requires microhabitat features such as cracking clay soils, rotting logs or stumps, coarse woody debris, leaf litter or surface rock to support prey food (i.e. frogs) or provide refuge habitat (DCCEEW, 2023). It is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions with clay soils but is also known from lake margins, wetlands and waterways (DCCEEW, 2023), but can occur in pure grassland associated with gilgais and cleared areas formerly mapped as open forests to woodlands associated with gilgai formations and wetlands (DCCEEW, 2023; SEWPaC, 2011). Regrowth vegetation in the north of the ETL study area and remnant and regrowth vegetation associated with the adjacent Dawson River and Banana Creek is mapped as essential habitat for the species (Figure 7.7).

Three habitat types for the species were recorded during the surveys:

- 1) drainage lines with fringing vegetation and some fallen timber;
- 2) gilgai and wetland habitat (with or without vegetation or fallen timber); and
- 3) marginal gilgai habitat (without vegetation or fallen timber).

Although the habitat in which the Ornamental Snake was recorded did not have gilgai present, the small drainage lines on land zones 3 or 4 with fringing vegetation and some fallen timber with the terrestrial ecology study area (including within the Project area) have been mapped as habitat for the Ornamental Snake (Figure 7.10).

Gilgai formations were identified in both Brigalow regrowth in the north of the ETL study area and in cleared and grazed paddocks in the south of the Project site (Figure 7.10).

These areas with gilgai can be differentiated into two habitat types: Gilgai and wetland habitat (with or without vegetation or fallen timber), and marginal gilgai habitat without vegetation or fallen timber.

The cleared gilgai to the east of the Moura-Baralaba Road were holding water during the post-wet season survey. They predominantly support grasses not aquatic flora species, indicating they do not hold water for extended periods of time. However, these gilgai are likely to support populations of frogs. While this area of gilgai is in a degraded state and the Ornamental Snake was not recorded in this area, it has been mapped as habitat for this species as it has been previously recorded in the region from similar habitat.

Similar gilgai formations occur on alluvial areas flanking the Dawson River and Banana Creeks in the additional investigation area and these have also been mapped as potential Ornamental Snake habitat.

Other areas of marginal gilgai were recorded in the south-western portion of the Project site on the broad floodplain associated with the Dawson River (Figure 7.10).

These areas seem to have been previously cultivated or blade ploughed and are used for cattle grazing. As a result, these gilgai are shallow, in a highly degraded state and are dominated by terrestrial grasses. Spotlighting surveys failed to detect the Ornamental Snake in these areas and the prevalence of grasses during both seasonal surveys indicates that these gilgais do not hold water for extended periods of time. However, they are considered to provide some marginal habitat for the Ornamental Snake during periods of extended rainfall when frog species may use the gilgai.

There is no potential habitat associated within the proposed road realignment or water extraction/release infrastructure.

The area of each habitat type for the species within the terrestrial ecology study area and Project area is outlined in Table 7.9 and shown on Figure 7.10.

The potential for the Project to impact this species has been assessed within section 7.10.1.4 of this chapter, and this species is further discussed in Chapter 9, Matters of National Environmental Significance.

Table 7.9: *Habitat for Ornamental Snake within terrestrial ecology study area and Project area*

Habitat type	Area (ha)	
	Terrestrial ecology survey area	Project area
Drainage lines with fringing vegetation and some fallen timber	65.3	23.5
Gilgai and wetland habitat (with or without vegetation or fallen timber)	54.9	34
Marginal gilgai habitat (without vegetation or fallen timber)	50.5	34.6
<b>Total</b>	<b>170.7</b>	<b>92.1</b>

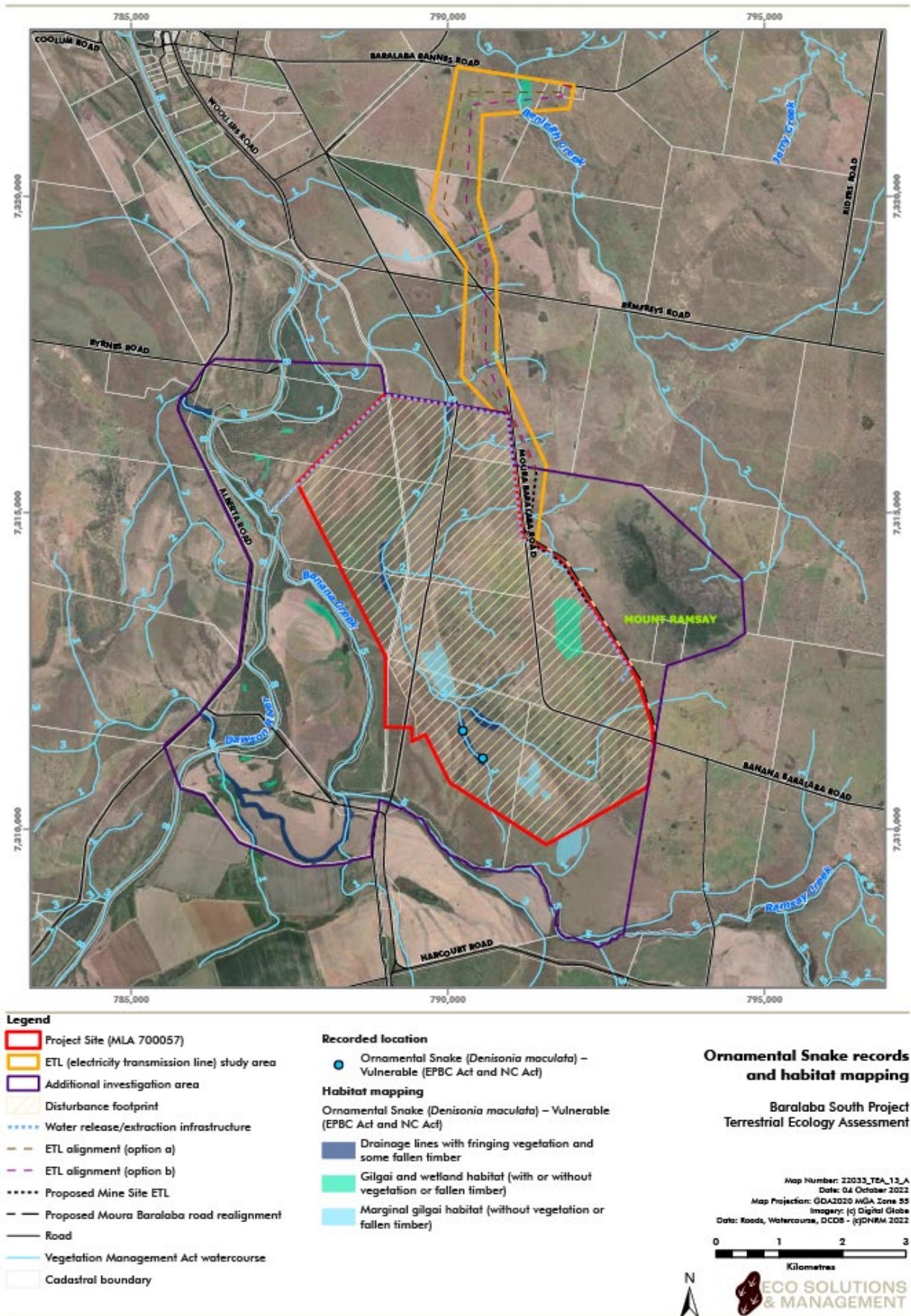


Figure 7.10: Ornamental Snake (*Denisonia maculata*) records and habitat within the terrestrial ecology study area



### *Koala*

The Koala is currently listed as endangered under the EPBC Act and Queensland NC Act; however, it was listed as vulnerable under the EPBC Act at the time of the controlled action decision.

No individuals of this species were observed directly during surveys. No evidence of the Koala was detected within the Project area, ETL study area or Mount Ramsay. Evidence of the species (scratches) was recorded at four locations on Queensland Blue Gum (*Eucalyptus tereticornis*) within Coolibah woodland (RE 11.3.3) along Banana Creek south-west of the Project area (Figure 7.11).

Although there was no evidence of Koala within the Project area, there is a moderate likelihood this species dispersing into the Project area as there are patches of suitable habitat present and evidence of Koala within 2 km of the Project area. Given the absence of evidence of usage and lack of suitable habitat within the ETL study area and on Mount Ramsay, it is considered unlikely the species utilises those areas.

In accordance with the EPBC Act referral guidelines for the vulnerable Koala and vegetation in which there was evidence of Koala presence, suitable habitat has been categorised as any forest or woodland containing species that are Koala food trees, or any shrubland with emergent food trees (i.e. trees of the *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca* genera) (DotE, 2014).

Areas that have been mapped as suitable habitat for the Koala in the terrestrial ecology study area are shown in Figure 7.11. A total of 887.1 ha of Koala habitat has been mapped within the terrestrial ecology study area, including 26.5 ha within the Project site and 0.4 ha required for the water release/extraction infrastructure.

The areas of riparian vegetation along the Dawson River and Banana Creek provide habitat for the Koala, including a narrow strip of riparian vegetation that will be required for the proposed water extraction/release pipeline to the Dawson River. Although this small area (0.1 ha) may be considered habitat for the species, no clearing of canopy trees in this area is proposed.

The habitat within the Project area has been assessed using the Koala Habitat Assessment Tool in the 'EPBC Act referral guidelines for the vulnerable Koala' (DotE, 2014) (Appendix F, Terrestrial Ecology Assessment). The habitat within the Project area and ETL study area does not constitute critical habitat for the Koala (score of 4) given the following:

- no direct or indirect evidence of Koala was detected in the Project area;
- forage habitat within the Project area is small, disconnected making dispersal through the area unlikely; and
- habitat within the Project area has limited potential to provide Koala refuge, essential lifecycle requirements.

The potential for the Project to impact this species has been assessed within section 7.10.1.7 of this chapter, and this species is further discussed in Chapter 9, Matters of National Environmental Significance.



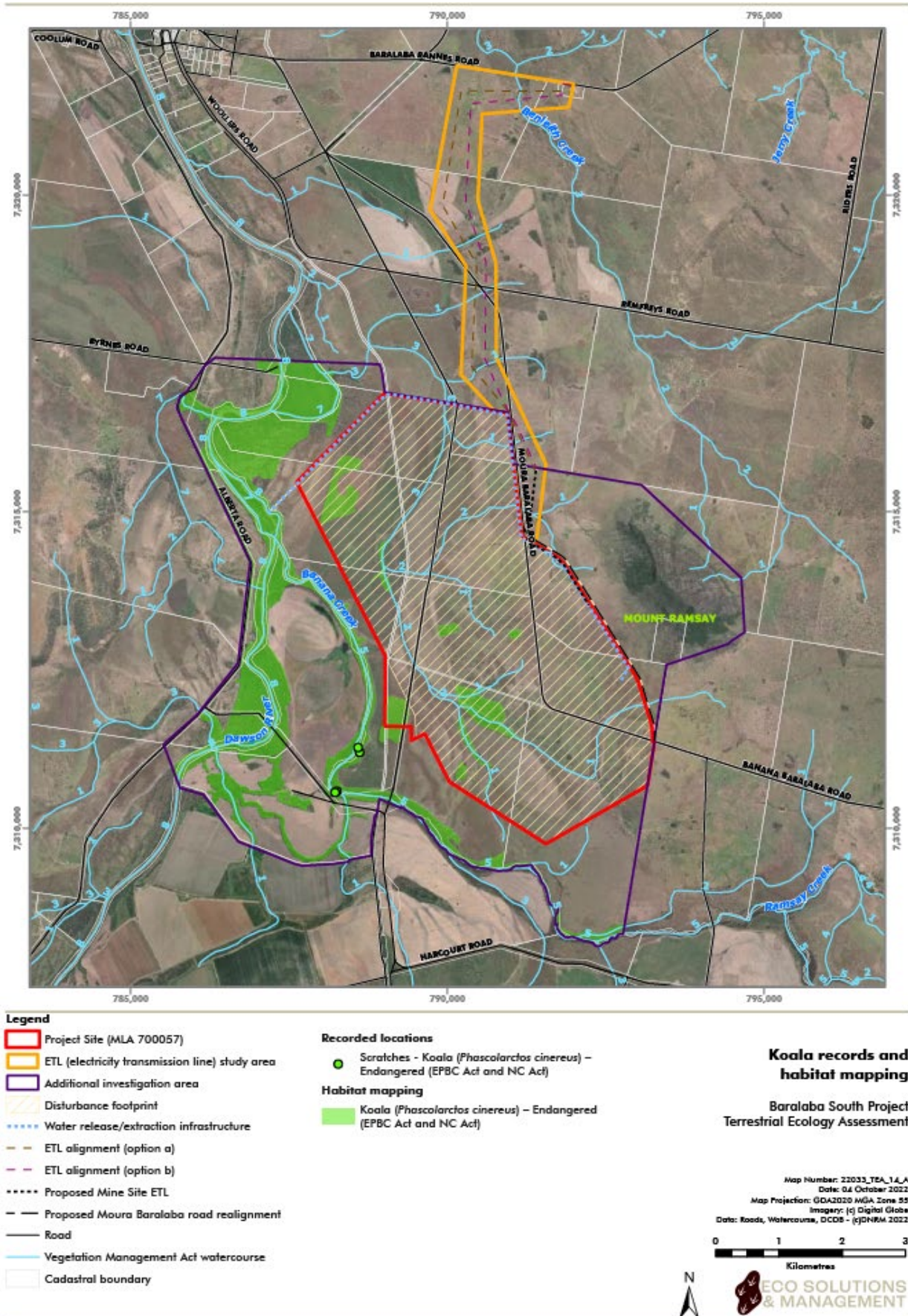


Figure 7.11: Koala (*Phascolarctos cinereus*) records and habitat

*Squatter Pigeon (Southern)*

The Squatter Pigeon (Southern) is listed as vulnerable under the EPBC Act and NC Act. This species was recorded at several locations in the terrestrial ecology study area including one location within the Project area (Figure 7.12). Suitable habitat for the Squatter Pigeon (Southern) has been identified in the Project area (Figure 7.12).

Habitat mapping for the Squatter Pigeon (Southern) (Figure 7.12) within the terrestrial ecology study area has been undertaken in consideration of the SPRAT profile for the species and most recent advice from the DCCEE. A detailed description of the criteria used to define Squatter Pigeon (Southern) habitat is provided within Appendix F, Terrestrial Ecology Assessment and is broadly summarised below.

Two types of Squatter Pigeon (Southern) habitat within the terrestrial ecology study area have been categorised:

- 1) foraging habitat—grassy woodlands dominated by Eucalyptus, Corymbia, Acacia or Callitris tree species, on sandy or gravelly soils (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) within 3 km of a waterbody; and
- 2) breeding habitat—foraging habitat within 1 km of a waterbody.

The area of each habitat type for the Squatter Pigeon (Southern) within the terrestrial ecology study area and the Project area is outlined in Table 7.10 and mapped in Figure 7.12.

Table 7.10: *Squatter Pigeon (Southern) habitat within the terrestrial ecology study area*

Habitat type	Area (ha)	
	Terrestrial ecology survey area	Project area
Breeding habitat	863.4	83.1
Foraging (not breeding) habitat	112.7	1.6
<b>Total</b>	<b>976.1</b>	<b>84.7</b>

The potential for the Project to impact this species has been assessed within section 7.10.1.5 of this chapter, and this species is further discussed in Chapter 9, Matters of National Environmental Significance.



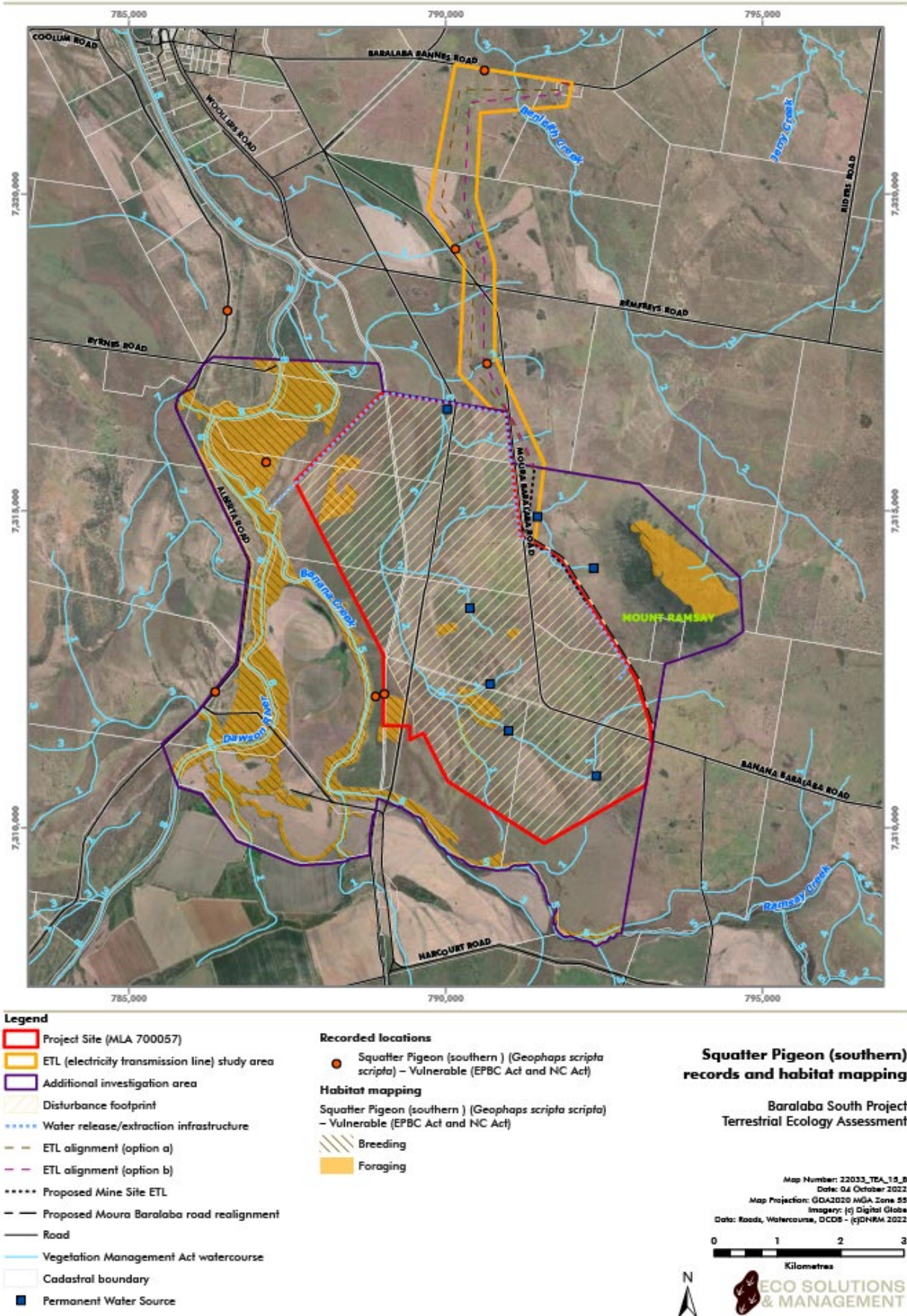


Figure 7.12: Squatter Pigeon (Southern) (*Geophaps scripta scripta*) records and habitat

### *Australian Painted Snipe*

The Australian Painted Snipe is listed as endangered under the EPBC Act (was listed as vulnerable at the time of the controlled action decision) and vulnerable under the NC Act.

This species was not recorded within the terrestrial ecology study area during the seasonal surveys; however, it has been recorded in surrounding areas and the terrestrial ecology study area is within the distribution of the species, which is cryptic and utilises ephemeral and permanent wetlands or other seasonally inundated habitats. The species can travel large distances to suitable habitat which it may use intermittently.

Known habitats for the species include terrestrial shallow wetlands, both ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, salt-marsh, dams, rice crops, sewage farms and bore drains with rank emergent tussocks of grass, sedges, rushes or reeds or Samphire, and often with scattered clumps of Lignum, Canegrass or sometimes Tea Tree. This species has been known to use wetland areas lined with trees, or that have some scattered fallen or washed-up timber (DCCEEW, 2023).

Two broad habitat types are considered to occur in the terrestrial ecology study area for the Australian Painted Snipe:

- 1) wetland and drainage lines with fringing vegetation; and
- 2) cleared gilgai that forms marginal habitat for this species.

The vegetated sections of the broad drainage lines in the south of the Project site that support Lignum, and Brigalow with gilgai in the north of the ETL provide areas of suitable habitat for this species.

The gilgai areas in the Project site appear to have been blade ploughed and support a low abundance of sedges indicating that they do not hold water for prolonged periods and would provide only seasonal foraging habitat for the species when gilgai are holding water. Similarly, gilgai and wetland habitats in the additional investigation area may provide foraging habitat for this species but lack canopy cover that forms part of the breeding habitat requirements (DCCEEW, 2023).

There is no potential habitat within the proposed road realignment or water extraction/release infrastructure corridor for this species.

The area of each mapped habitat type within the terrestrial ecology study area is detailed in Table 7.11 and shown on Figure 7.13.

The potential for the Project to impact this species has been assessed within section 7.10.1.6 of this chapter, and this species is further discussed in Chapter 9, Matters of National Environmental Significance.

Table 7.11: *Australian Painted Snipe habitat within the terrestrial ecology study area and Project area*

Habitat type	Area (ha)	
	Terrestrial ecology study area	Project area
Wetland and drainage lines with fringing vegetation	86.2	23.4
Cleared gilgai that forms marginal habitat	84.4	68.5
<b>Total</b>	<b>170.6</b>	<b>91.9</b>



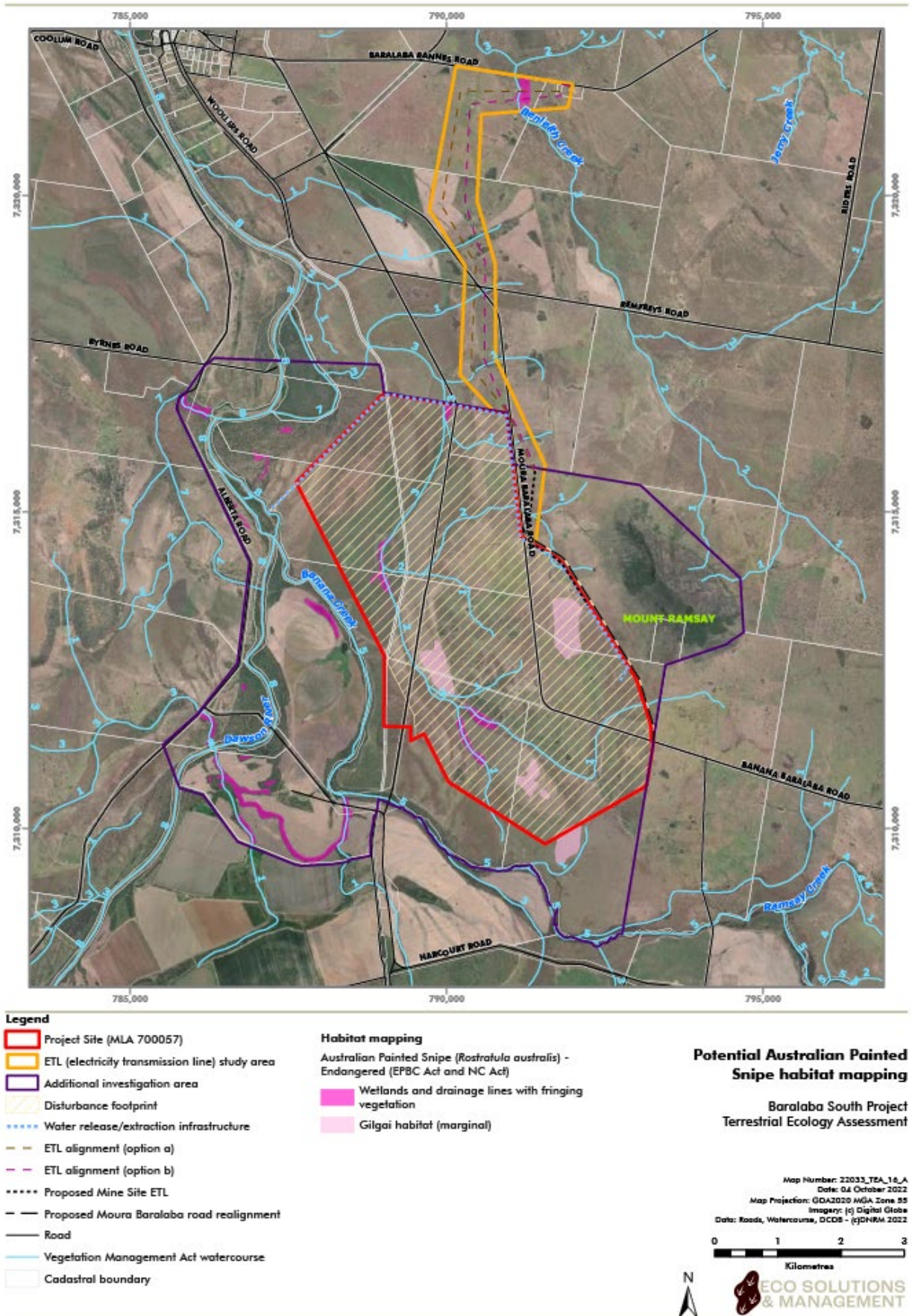


Figure 7.13: Australian Painted Snipe (*Rostratula australis*) potential habitat within the terrestrial ecology study area

#### 7.4.4.2 EPBC Act migratory species

Two migratory listed species under the EPBC Act were considered to have a moderate likelihood of occurring within the terrestrial ecology study area, namely:

- 1) Glossy Ibis; and
- 2) Latham's Snipe.

Details of habitat identified within the terrestrial ecology study area for these species is provided below. Where a species is listed as migratory under the EPBC Act and listed under the NC Act, it has been included in this section and not section 7.4.4.3.

##### *Glossy Ibis*

Although not recorded in the terrestrial ecology study area, it has been recorded in the region, with the nearest record approximately 7 km west of the terrestrial ecology study area (CSIRO, 2023), and has a moderate likelihood of occurring in the Project area.

This species utilises the shallows of swamps, floodwaters, sewage ponds and flooded, moist irrigated pasture (Morcombe and Stewart, 2013) and may seasonally use dams, wetland habitats and cleared gilgai in the Project site and ETL study area. There is no potential habitat within the proposed road realignment or water extraction/release infrastructure corridor for this species.

The potential for the Project to impact this species has been assessed in Chapter 9, Matters of National Environmental Significance.

##### *Latham's Snipe*

Although not recorded in the terrestrial ecology study area, it has been recorded in the region, with the nearest record approximately 20 km north of the terrestrial ecology study area (CSIRO, 2023), and has a moderate likelihood of occurring in the Project area.

This migratory species prefers soft wet ground or shallow water with tussocks, wet paddocks, seepage below dams, irrigated areas, scrub or open woodland (Pizzey *et al.*, 2012) and may use similar habitats as the Australian Painted Snipe within the terrestrial ecology study area.

The marginal gilgai areas in the Project site and additional investigation area may also provide seasonal opportunistic foraging habitat for this species. There is no potential habitat within the proposed road realignment or water extraction/release infrastructure corridor for this species.

The potential for the Project to impact this species has been assessed in Chapter 9, Matters of National Environmental Significance.

#### 7.4.4.3 Nature Conservation Act species

Two species listed as threatened under the NC Act and one species listed as SLC were identified within the terrestrial ecology study area, respectively:

- Greater Glider;
- Yellow-bellied Glider; and
- Short-beaked Echidna.

An additional species, the White-throated Needletail, listed as vulnerable under the NC Act was considered to potentially occur in the Project area.

The Greater Glider (Southern and Central), Yellow-bellied Glider and White-throated Needletail were not listed at the time of the EPBC Act Controlled Action Decision, and although currently listed under the EPBC Act, have not been considered MNES for the Project. Therefore, these species will be assessed as MSES for the Project in this section.

Details of habitat identified within the terrestrial ecology study area for these species is provided below.

### *Greater Glider (Southern and Central)*

No evidence of the Greater Glider (Southern and Central) was detected in the Project area.

The Greater Glider was identified within the remnant riparian vegetation (RE 11.3.25— *E. tereticornis* or *E. camaldulensis* woodland fringing drainage lines) along the Dawson River and the Dawson River Anabranche (Figure 7.14).

The Greater Glider occurs in a range of eucalypt-dominated forest and woodland habitats but favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (TSSC, 2016b).

Habitat mapping for the Greater Glider within the study area has been undertaken in accordance with the preferred habitat for the species, vegetation communities in which the species was recorded in the terrestrial ecology study area and experience of ecologists in detecting the species throughout central Queensland. Greater Glider habitat has been categorised as:

- breeding/shelter habitat—remnant vegetation with:
  - continuous canopy;
  - hollow-bearing trees with suitably sized hollows; and
  - suitable fodder trees (*Eucalyptus* spp.); and
- foraging/dispersal habitat—*Eucalyptus* woodlands with continuous open canopy.

The areas of riparian vegetation along the Dawson River and Banana Creek would provide both breeding/shelter and foraging/dispersal habitat for the Greater Glider. This includes a narrow strip of riparian vegetation which will be traversed by the proposed water extraction/release pipeline to the Dawson River.

There is no potential habitat within or adjacent to the proposed road realignment or ETL study area for the Greater Glider and no evidence of the Greater Glider was detected within these areas. The ETL study area is predominantly cleared, with these areas only supporting scattered trees which do not provide suitable canopy cover or hollows. Two small, discrete patches of eucalypt woodland regrowth (RE 11.4.8) are isolated from any potential habitat and are too small to provide habitat for the species.

No suitable habitat for the Greater Glider was identified within the Project site. Although there is a small patch of remnant Eucalypt woodland (RE 11.5.9) within the central southern portion of the Project site, this remnant RE is considered unsuitable habitat for the Greater Glider due to:

- the lack of hollow-bearing canopy tree species, and/or
- the lack of connection between the disconnected nature of the remnant REs within the Project site with suitable breeding/shelter habitat for the Greater Glider.

All other areas within the Project site are either unsuitable vegetation communities (RE 11.5.15—Semi evergreen vine thicket) or regrowth communities that do not contain suitable *Eucalyptus* species to provide habitat (either breeding/shelter or foraging/dispersal) for the species.

Potential habitat mapped for the Greater Glider within the terrestrial ecology study area is shown in Figure 7.14. Approximately 0.4 ha of Greater Glider habitat along the Dawson River would be required for the water release/extraction pipeline, however, no clearing of canopy habitat trees is proposed in this area.

The potential for the Project to impact this species has been assessed within section 7.10.2.6 of this chapter.

*Yellow-bellied Glider (south-eastern)*

No evidence of the Yellow-bellied Glider (south-eastern) was detected in the Project area during the seasonal fauna surveys.

The Yellow-bellied Glider was recorded within remnant riparian vegetation (RE 11.3.3) along Banana Creek (Figure 7.15).

The Yellow-bellied Glider occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Kavanagh *et al.*, 1995), and shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter with foraging (TSSC 2022a).

Extensive areas of riparian vegetation dominated by Eucalyptus species occur throughout the Banana Creek and Dawson River systems and provide potential habitat (767.5 ha) for the Yellow-bellied Glider. A small area of this habitat (approximately 0.4 ha) on the edge of RE 11.3.25 on the Dawson River will be required for the proposed water extraction/release infrastructure. No clearing of canopy habitat trees is proposed in this area.

Potential habitat mapped for the Greater Glider within the terrestrial ecology study area is shown in Figure 7.15. No suitable habitat for the Yellow-bellied Glider was identified within the Project area. Potential habitat within the Project site lacks mature, tall, moist vegetation communities that support abundant hollow-bearing trees and are somewhat removed from the Dawson River riparian corridor. This significantly limits accessibility of the Project site, and therefore this species is unlikely to access these areas.

There is no suitable habitat for this species along the road realignment or the ETL study area. The ETL study area is predominantly cleared, with these areas only supporting scattered trees which do not provide suitable canopy cover or hollows. Two small, discrete patches of eucalypt woodland regrowth (RE 11.4.8) are isolated from any potential habitat and are too small to provide habitat for the species.

The potential for the Project to impact this species has been assessed within section 7.10.2.7 of this chapter.



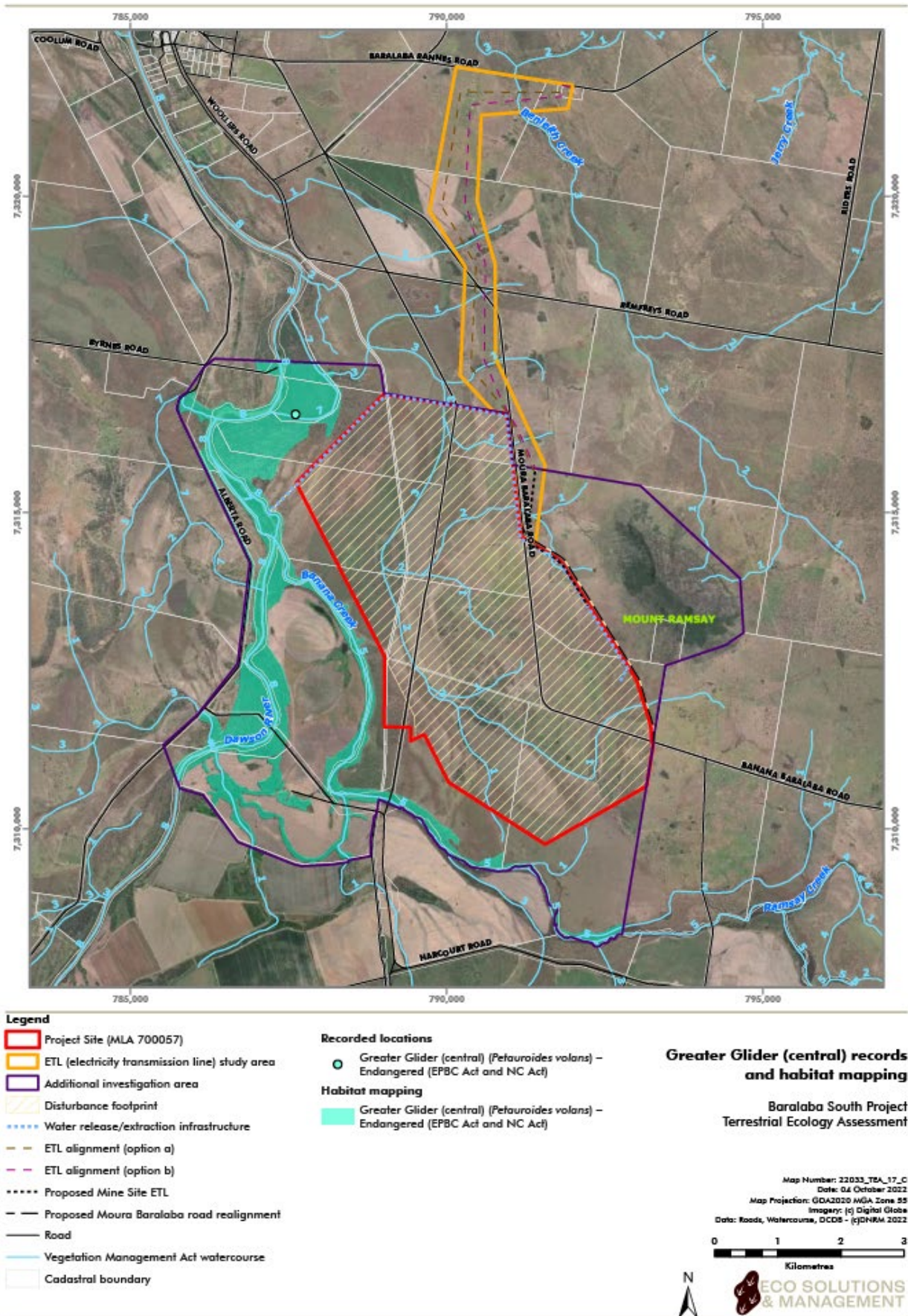


Figure 7.14: Greater Glider (*Petauroides volans*) records and habitat



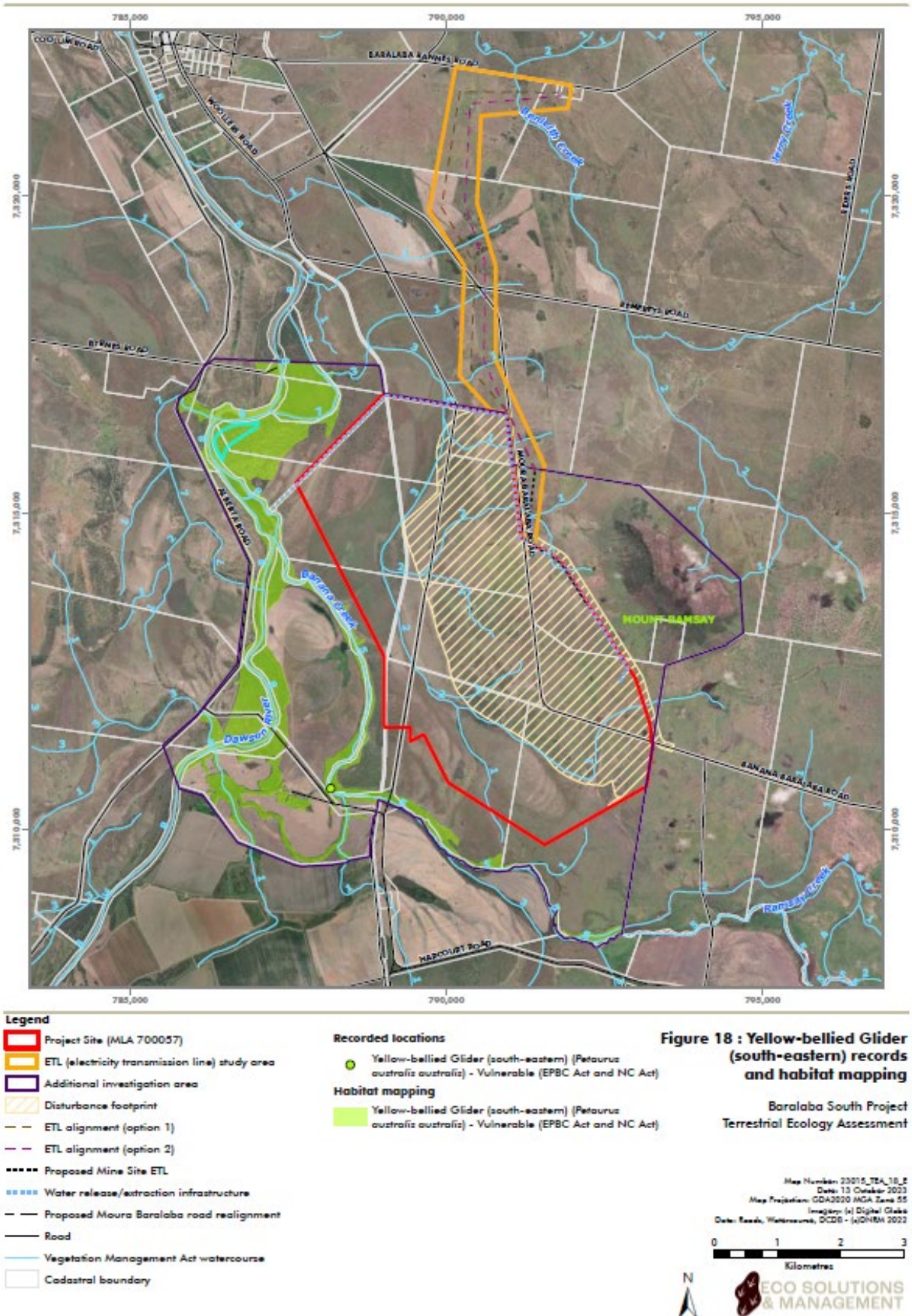


Figure 7.15: Yellow-bellied Glider (south-eastern (*Petaurus australis australis*)) records and habitat

### *Short-beaked Echidna*

The Short-beaked Echidna was recorded at five locations in the additional investigation area during the fauna surveys (Figure 7.16).

The species is relatively common and known in the broader area and uses a range of habitats, including disturbed or cleared areas. It shelters in logs, crevices, burrows or piles of litter and feeds on ants, termites and other soil invertebrates, particularly beetle larvae (Menkhorst and Knight, 2011).

All areas of the terrestrial ecology study area provide potential habitat for this species; however, remnant areas are considered to be more important for this species (Figure 7.16). Remnant habitat accounts for 996.1 ha in the terrestrial ecology study area including 10.1 ha in the Project site and riparian area traversed by the water extraction/release pipeline.

The potential for the Project to impact this species has been assessed within section 0 of this chapter.

### *White-throated Needle-tail*

The White-throated Needle-tail was not recorded in the study area during seasonal surveys; however, it is widespread, and it has been recorded in the region and is considered to have a moderate likelihood of occurring in the Project area. The White-throated Needle-tail has the potential to overfly all types of habitats within the study area as part of wider foraging movements, although forested and treed areas are likely to be preferred. There is no evidence of traditional roost sites within the study area. Potential overfly habitat in the study area equates to approximately 1,135 ha and potential overfly habitat within the Project area accounts for approximately 16.7 ha of forested areas (Figure 7.17).

The potential for the Project to impact this species has been assessed within section 0 of this chapter.



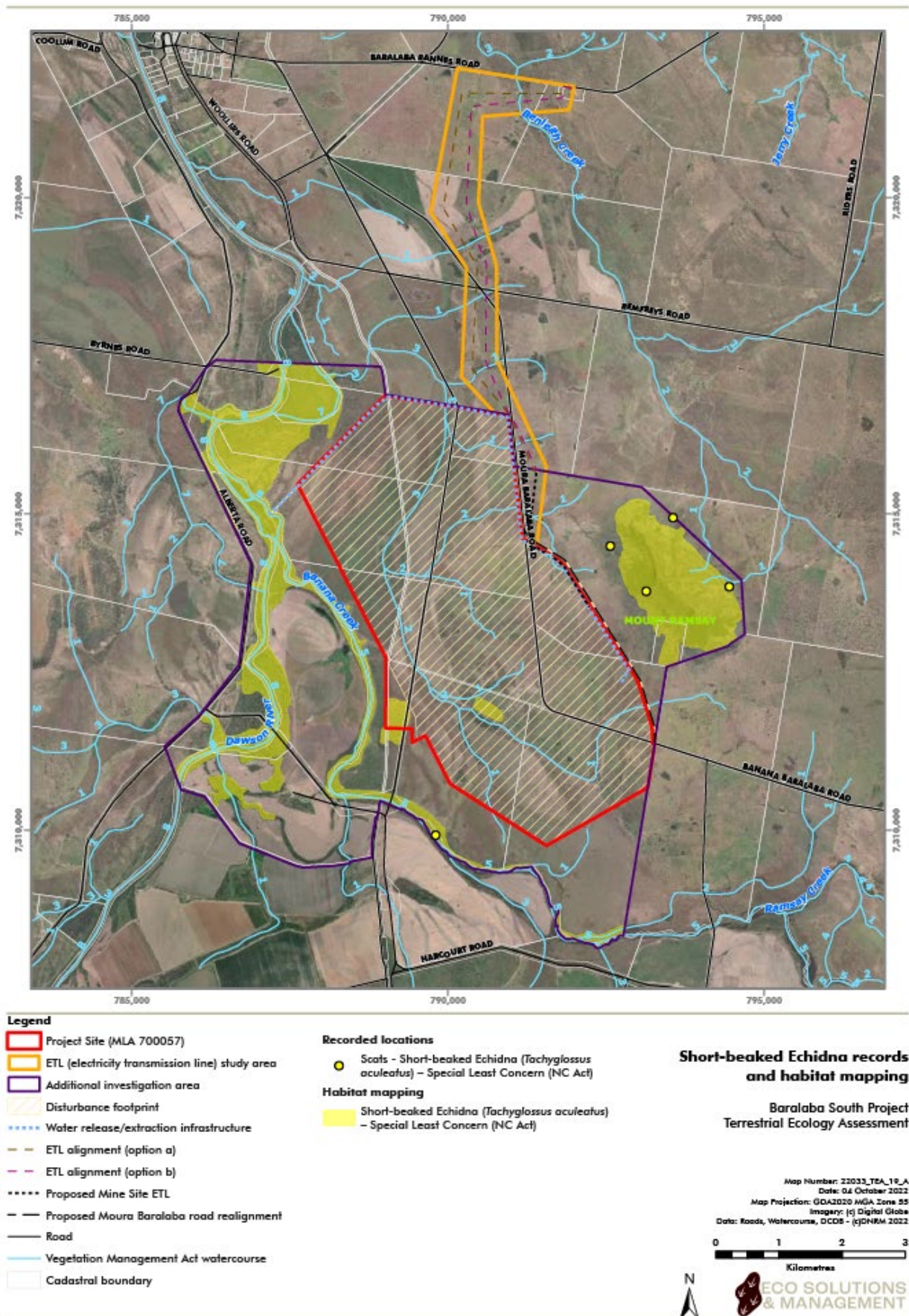


Figure 7.16: Short-beaked Echidna (*Tachygllossus aculeatus*) records and habitat within the terrestrial ecology study area



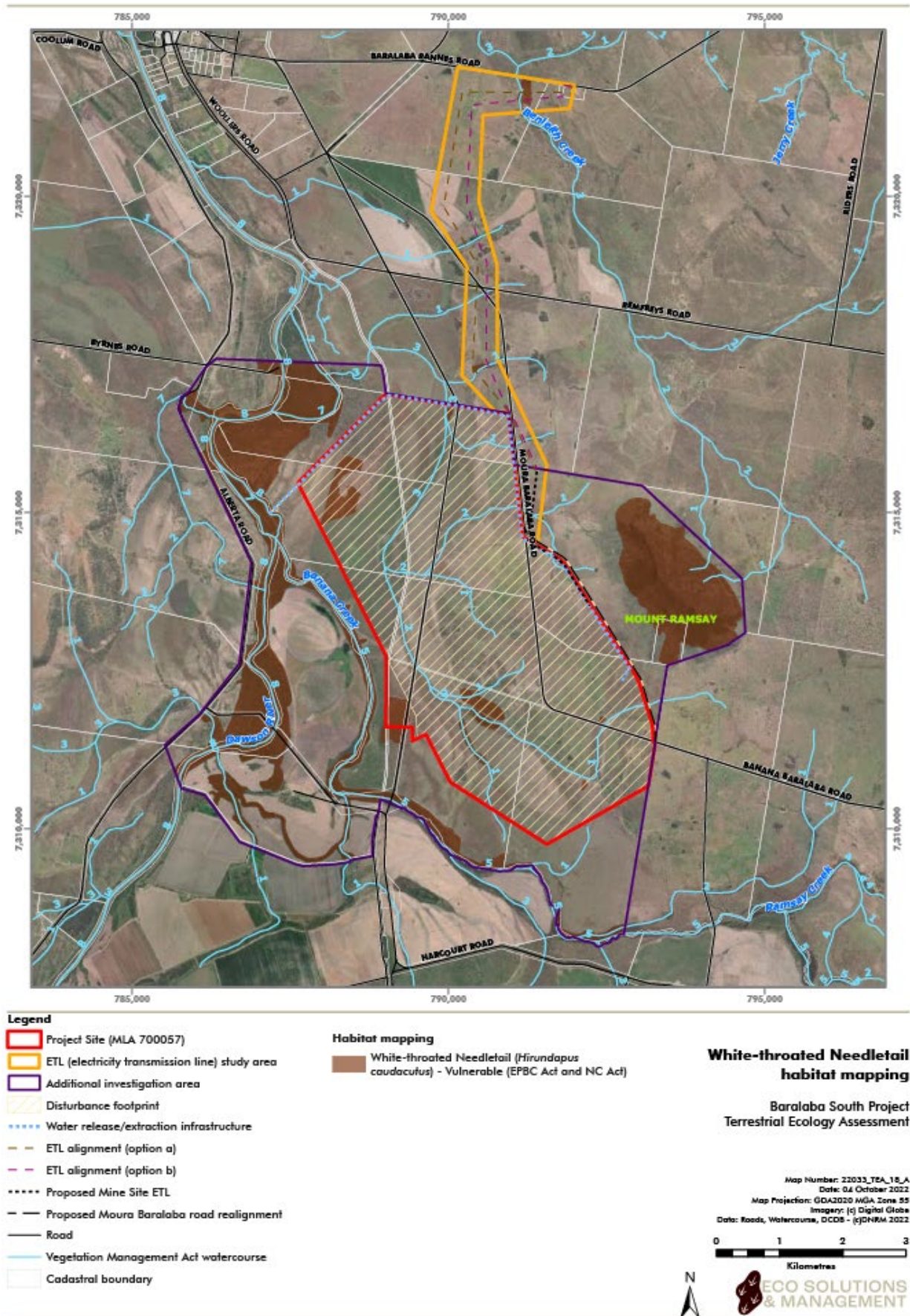


Figure 7.17: White-throated Needletail habitat within the terrestrial ecology study area

### 7.4.5 Introduced species - weeds and pest animals

Four flora species recorded in the terrestrial ecology study area are recognised as 'Weeds of National Significance' (WoNS) by the Australian Government and Queensland state declared Category 3 Restricted flora species under the *Biosecurity Act 2014* (Qld). These species include:

- Tiger Pear (*Opuntia aurantiaca*);
- Common Prickly Pear (*Opuntia stricta*);
- Velvet Prickly Pear (*Opuntia tomentosa*); and
- Parthenium Weed (*Parthenium hysterophorus*).

Two additional Queensland state declared Category 3 Restricted flora species under the *Biosecurity Act* were recorded during field surveys:

- 1) Water Lettuce (*Psittia stratiotes*) in a farm dam north of RE 11.5.9 only; and
- 2) *Harrisia Cactus* (*Harrisia martinii*) uncommonly occurring in the high-value regrowth RE 11.4.9a.

All weed species have generally been recorded infrequently in small numbers within both remnant and non-remnant vegetation in the terrestrial ecology study area.

Six introduced pest fauna species listed under the *Biosecurity Act* have been recorded in the terrestrial ecology study area during the field surveys, including:

- 1) Cane Toad (*Rhinella marina*);
- 2) Wild Dog (*Canis familiaris*);
- 3) Common Myna (*Sturnus tristis*);
- 4) European Rabbit (*Oryctolagus cuniculus*);
- 5) Feral Cat (*Felis catus*); and
- 6) Feral Pig (*Sus scrofa*).

A description of introduced flora species and feral animals in the terrestrial ecology study area is provided in Appendix F, Terrestrial Ecology Assessment. The potential for the Project to introduce additional weed and/or pest species, and the management of known weed and pest species is described in Chapter 8, Biosecurity.

## 7.5 Aquatic ecological values

This section outlines the aquatic ecology values identified through the aquatic ecology assessment. It is intended to provide sufficient information for the basis of the impact assessments completed in later sections and other chapters.

### 7.5.1 Wetlands and watercourses

Waterways and wetlands mapping (DES, 2021) identifies the major water types in the study area that include watercourses, waterways, drainage lines and wetlands, namely:

- Within the Project area and immediate surrounds:
  - A lacustrine wetland and three palustrine wetlands. One of the palustrine wetlands is mapped as a HES wetland while the other two are mapped as general ecological significance (GES) wetlands (Figure 7.19); and

- A number of minor (mapped as stream order 1 and 2) waterways and drainage lines that are tributaries of one main unnamed (stream order 3) waterway that flows through the Project area. These are mapped as drainage features under the *Water Act 2000* (Qld) (DRDMW, 2023).
- Adjacent to and downstream of the Project area:
  - Shirley's Gully: the reach of the main unnamed waterway closest to the confluence with the Dawson River Anabranh, which is mapped as a stream order 3 waterway but is not mapped under the *Water Act* (DRDMW, 2023);
  - the Dawson River and the Dawson River Anabranh: mapped as a stream order 8 waterway and lacustrine wetland upstream of the Neville Hewitt Weir and classified as watercourses under the *Water Act* (DRDMW, 2023); and
  - Banana Creek: mapped as a stream order 5 waterway and partially mapped as a lacustrine wetland (near the confluence with the Dawson River) and classified as a watercourse under the *Water Act* (DRDMW, 2023).
- Benleith Creek in the north of the ETL study area is mapped as a stream order 3 waterway but is not currently mapped under the *Water Act*.

All of the first, second and third order waterways in the Project area and the ETL are mapped as vegetation management watercourses under the VM Act (Figure 7.19) and they are mapped as drainage features under the *Water Act* (Figure 7.18, Appendix G, Aquatic Ecology Assessment). Aquatic values of waterways within the Project area are typical of ephemeral waterways having minimal instream habitat features that have been highly disturbed by activities associated with the adjacent land use. The minor waterways were generally considered to be in poor condition.

The palustrine wetland on the western border of the MLA (PW1) is mapped as a wetland under the VM Act (Figure 7.19). This wetland is also identified on the map of referable wetlands as a High Ecological Significance (HES) wetland within a wetland protection area (WPA). The MLA overlays the north-east portion of the WPA including 20.2 ha (approximately 60%) of the HES wetland. This wetland is recognised as a MSES and has been assessed under the 'Queensland Environmental Offsets Policy Significant Residual Impact Guideline' (DEHP, 2014) (section 7.10.2). The two other palustrine wetlands are mapped as GES wetlands (Figure 7.19). Of these, only one (PW2) has been mapped as supporting remnant vegetation (Figure 7.19).

The Dawson River and its anabranh are stream order 8 waterways and Banana Creek is a stream order 5 waterway. Both are outside the Project area and are mapped as watercourses under both the *Water Act* and the VM Act.

Within the broader aquatic ecology study area in the larger waterways adjacent to and downstream of the Project area in Banana Creek, Shirley's Gully, and the Dawson River and Anabranh, aquatic habitat conditions were assessed as fair. These waterways had a good variety and availability of instream habitat, a variety of flow regimes, good bank stability and, although the adjacent lands were disturbed, a narrow but mainly intact riparian zone remained along the waterways. The Dawson River, its anabranh and associated tributaries downstream of the Project were also mapped as a lacustrine wetland ecosystem, though modified by the Neville Hewitt Weir.



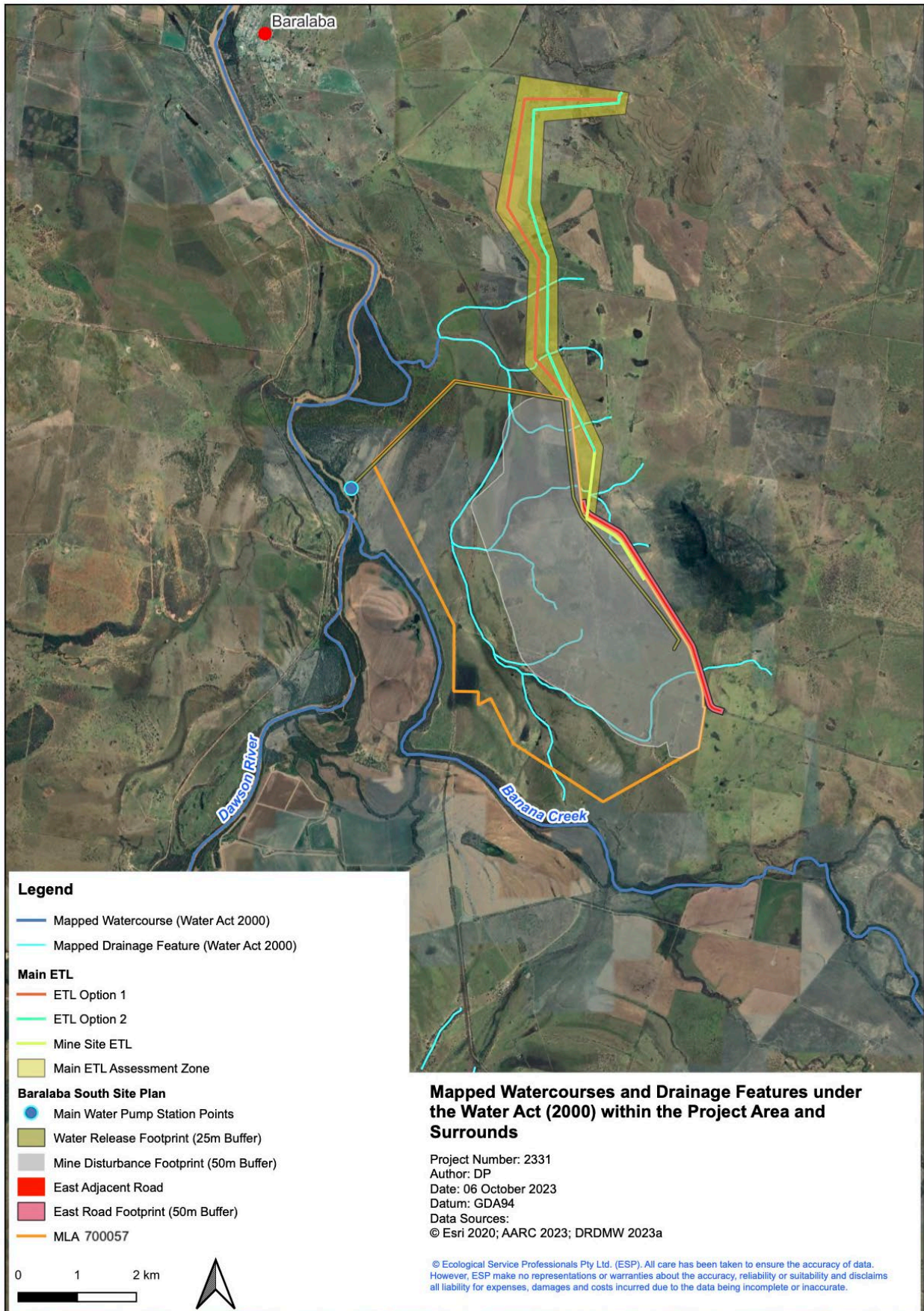


Figure 7.18: Mapped watercourses and drainage features, Project area and surrounds



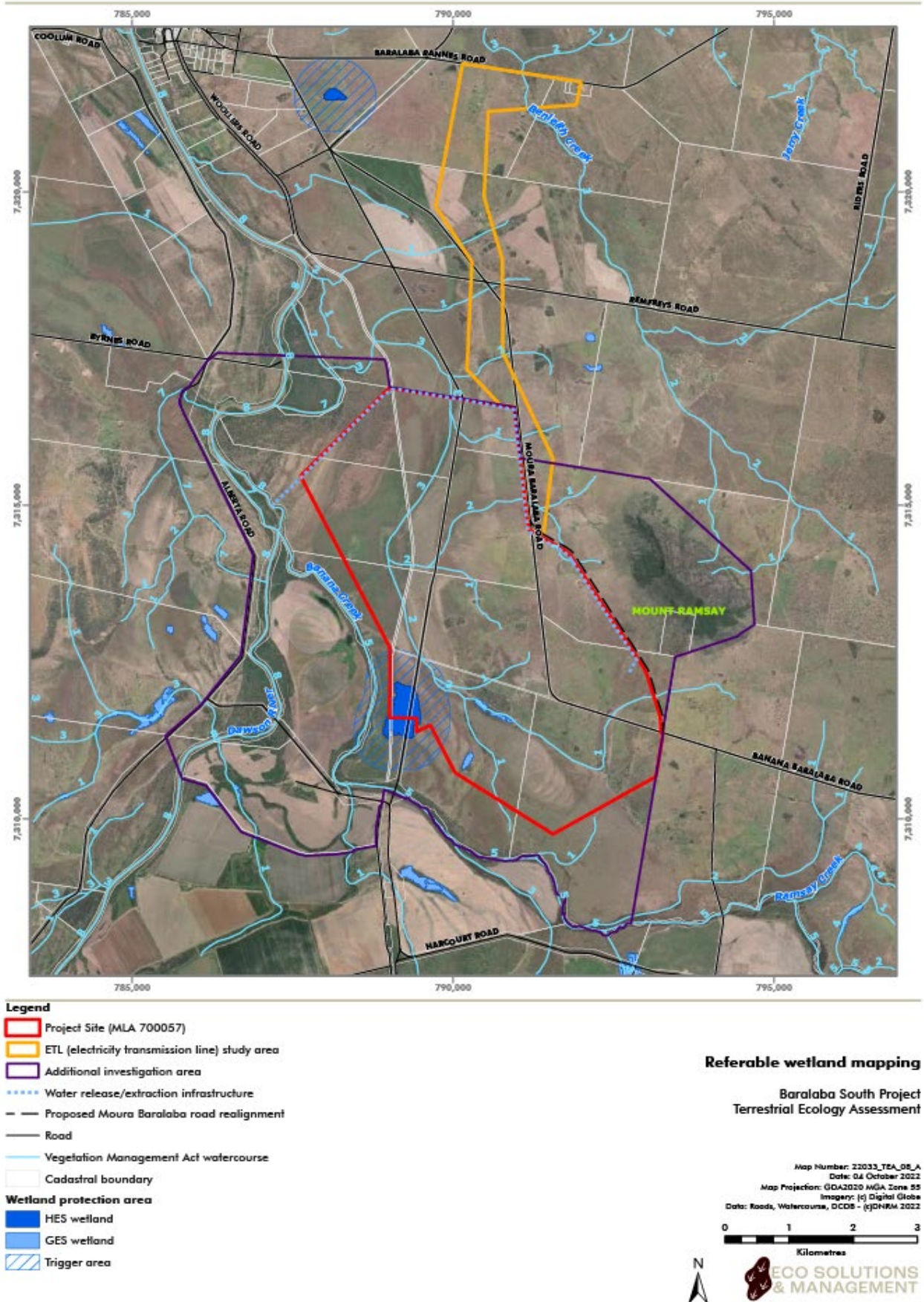


Figure 7.19: Referrable wetland mapping

## 7.5.2 Aquatic habitat

### 7.5.2.1 Aquatic habitat of the region

The aquatic habitat condition of waterways and wetlands in the Dawson River sub-basin is variable, ranging from good condition and areas of high ecological value on the Dawson River, and surrounding waterways and wetlands; to low to moderate habitat condition and value in the minor waterways and wetlands (Appendix G, Aquatic Ecology Assessment).

Riparian vegetation has been reduced or disturbed across most of the Dawson River sub-basin, generally a result of land clearing associated with surrounding land uses and weed presence. The riparian vegetation of the Dawson River near Baralaba is considered to be in moderate to very good condition, while smaller waterways and wetlands tend to have less intact and significantly reduced riparian zones (Appendix G, Aquatic Ecology Assessment).

Bank stability in the region is mostly stable but has been impacted by areas of erosion due to stock and vegetation clearing.

The instream habitat of riverine wetlands and major watercourses of the region are dominated by pool habitat and is typically comprised of shallow and deep pools, woody debris, detritus, low coverage of instream aquatic plants and overhanging and trailing bank vegetation fringing the edges providing additional stream cover.

The aquatic ecological values of the waterways adjacent to and downstream of the Project area (i.e. Dawson River and anabranch and Banana Creek and Shirley's Gully) are considered moderate to high. The habitat of these waterways has been permanently affected by the Neville Hewitt Weir, which has reduced habitat diversity, i.e. changed from riverine habitat and its associated pool and riffle / run sequences to lacustrine habitat. These waterways have good instream habitat conditions (such as large woody debris), provide long-lasting refuges and good connectivity, support an abundance and diversity of aquatic communities.

### 7.5.2.2 Wetlands within the Project area

The lacustrine and palustrine wetlands within the Project area are considered to have moderate ecological value, as they are providing long-term refuge and support aquatic flora and fauna communities.

The ephemeral palustrine wetland at site PW2 and the lacustrine wetland may provide dry season refuge for aquatic fauna; however, connectivity to other waterways is considered to be rare (only during significant rainfall events). These wetlands do not provide unique habitat features or suitable habitat for listed aquatic species.

Habitat condition in the lacustrine wetland (LW1) is considered poor, with minimal instream habitat features and a high-level of disturbance (i.e. modified/dammed wetland), while the habitat condition of the palustrine wetlands (PW1 and PW2) is considered fair, with more available diverse instream habitat features and lower disturbance from surrounding land uses.

Although the HES wetland (PW1) is ephemeral in nature, was dry during the three surveys and has been historically cleared, it is evident that inundation occurs under certain conditions (i.e. during significant wet seasons). The proximity of the wetland to the Dawson River Anabranch provides the possibility for aquatic fauna to find refuge in the wetland after periods of high-flow and flood events. However, connectivity to other waterways would be rare and the wetland would not provide long-lasting habitat. The HES wetland does not support diverse aquatic communities (i.e. fish and macroinvertebrate communities) and does not offer any increased aquatic value than other palustrine wetlands in the Project area, as indicated by site PW2. It is not considered to fulfil to criteria of a wetland of high ecological value from an aquatic ecological perspective.

### 7.5.2.3 Minor waterways and drainage lines within the Project area

All the minor unnamed waterways have low aquatic ecological value due to their ephemeral nature and poor connectivity. Aquatic habitat conditions at minor waterway sites (UW1T and UW2) within the Project area are in poor to moderate condition (Figure 7.20). These sites are characterised as ephemeral drainage lines or overland flow paths that have minimal instream habitat features (or are dry and largely disconnected) and are highly disturbed by activities associated with the adjacent land use (e.g. riparian zone clearing and access by cattle). These systems do not provide unique habitat features or suitable habitat for listed threatened aquatic species.

### 7.5.2.4 Waterways upstream, adjacent to and downstream of the Project area

Aquatic habitat conditions at Banana Creek (BC1 and BC2), Shirley’s Gully (SG1), the Dawson River (DR1) and the Dawson River Anabranh (DA1) are considered moderate (Figure 7.20); and they were generally better than the waterways and wetlands within the Project area (UW1T and UW2) (Figure 7.20).

Good bank stability, good variety of flow regimes (during wet periods) and good variety and availability of instream habitat were identified within the three major waterways.

Although the adjacent lands are disturbed, a reduced but mainly intact riparian zone has remained along the waterways. These sites are considered suitable to support a variety of aquatic fauna. Their permanent nature provides dry season refuges, connectivity and passage to upstream and downstream habitats during periods of flow. These sites provide some favourable fauna habitat features, including instream structure for resting and refuge (particularly for turtles) and some sections of the banks are considered to potentially provide suitable habitat for turtle nesting and/or Platypus burrows.

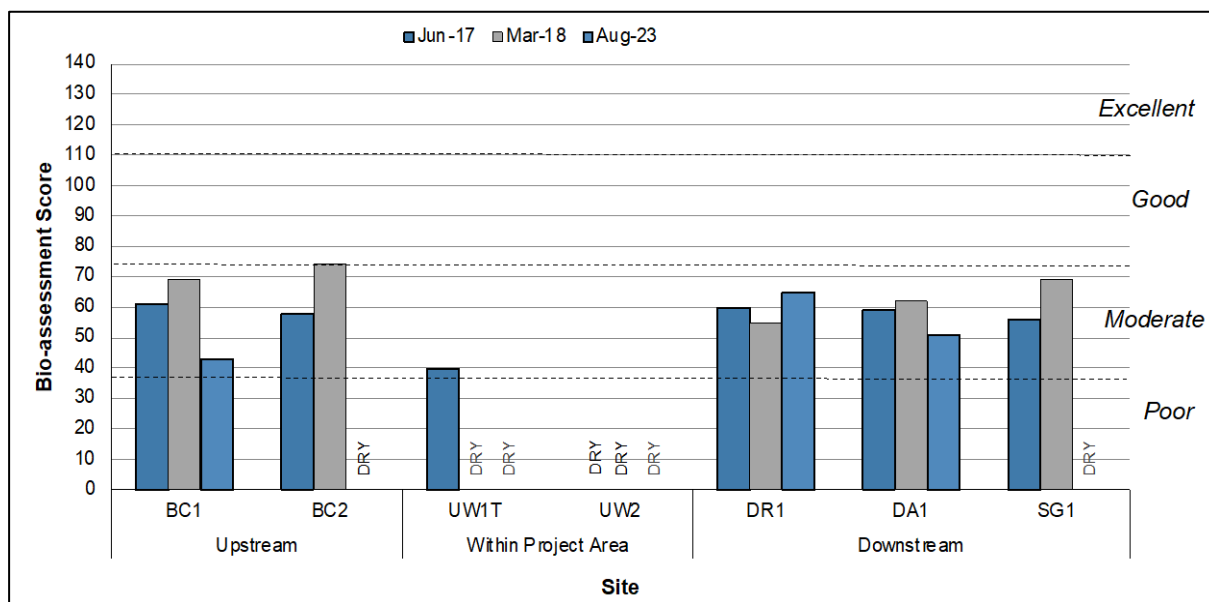


Figure 7.20: Aquatic habitat bio-assessment scores

### 7.5.3 Waterways for fish passage

Most of the waterway works associated with the Project will be undertaken on the MLA under the conditions of an EA. As such, a waterway barrier works approval under the Planning Act is not required for those works. However, waterways providing for fish passage can be considered MSES under the EO Regulation, where the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway. This would include impacts to (removal of) waterways within the proposed mine disturbance footprint. As such, fish passage requirements in the study area were considered in



this assessment. The areas of risk in and around the Project area, as illustrated in Figure 7.21, and mapped in the Queensland waterways for waterway barrier works spatial data layer include:

- The Dawson River and Anabranche and Banana Creek are classified as major risk (purple) of adverse impacts to fish movement;
- The minor waterways and drainage lines that are tributaries of the main unnamed waterway (Tributary 8) are classified as low (green) to moderate (orange) risk of adverse impacts to fish movement; however, the majority of these mapped waterways do not exhibit any discernible waterway features (tributaries 1 to 6 have no characteristics of a waterway for fish passage, Tributary 7 has some characteristics of a waterway for fish passage (Figure 7.21));
- The main unnamed waterway (Tributary 8, known as Shirley's Gully at its downstream extent) is variously classified as low (green), moderate (amber) and high (red) risk of adverse impacts to fish movement (the upstream reaches have characteristics of a waterway for fish passage; however, fish communities are likely to persist in this area due to the presence of a farm dam; and
- Benleith Creek is classified as high (red) risk of adverse impacts to fish movement.

The proposed Moura-Baralaba Road realignment will be completed off-lease, and the design of waterway crossings (culverts) will consider fish passage and water flow. The proposed road realignment crosses one waterway mapped as low risk (green). Significant impacts to fish movement are not considered likely.

The proposed ETL is to occur outside the MLA; the infrastructure required for the ETL crosses six waterways; one moderate, four low and one at high risk of adverse impacts to fish movement. However, given the nature of the proposed infrastructure to be developed; these systems are not considered to be impacted by the proposed ETL. The proposed water release/extraction infrastructure and water pump station has been designed to primarily occur within the MLA and does not cross any waterways outside of the MLA.

### 7.5.3.1 Ground-truthed Project area waterways

Surveys were conducted to ground truth the waterways in the Project area (Figure 7.22) (Appendix G, Aquatic Ecology Assessment). Based on the assessment, there are:

- Most of the waterways (mapped tributaries 1 to 6 in Figure 7.21) have no characteristics of a waterway for fish passage.
- Tributary 7 has some characteristics of a waterway for fish passage – it is mapped as green (low risk of impact) on the WWBW spatial mapping (Figure 7.21). It did not have obvious defined bed and banks. The feature was flat, wide, and overgrown with terrestrial plants. There is a constructed farm dam on the tributary that likely only receives overflow during periods of high rainfall. Aerial photography and topographical data indicates a distinct channel occurring upstream of the dam, and the vegetation downstream is indicative of riparian vegetation. Therefore, during periods of high rainfall and flood events, Tributary 7 likely provides fish passage to its upper reaches.
- Tributary 8 provides fish passage in the proposed mine disturbance area- the headwaters of Tributary 8 in the Project area is a mapped green (low risk of impact) waterway. Downstream reaches (generally not in the proposed disturbance area) are mapped as red (high risk of impacts) and amber (moderate risk of impacts) (Figure 7.21). The headwaters of Tributary 8 has well defined, continuous bed and banks; an obvious channel; various aquatic plant species and complex structure providing potential fish habitat. The upstream reaches of Tributary 8, between sites T8-D1 and T8-D3, have the characteristics of a waterway for fish passage. However, it should be noted that fish communities are likely to persist in this area solely due to the presence of the farm dam downstream of site T8-D3. Downstream of this dam, it is difficult to determine the alignment of Tributary 8, which has degraded significantly due to localised land uses and lack of flow due to the damming of upstream reaches. Aerial photography, topographical data, and flood modelling determined that the waterway channel is further to the west than indicated on the WWBW mapping. Tributary 8 meanders in and out of the far north-western extent of the Project disturbance footprint, and this has been mapped accordingly in Figure 7.22.



- The waterways within the MLA do not connect to any important breeding, feeding or refuge areas and fish passage is currently very limited due to their ephemeral nature (Appendix G, Aquatic Ecology Assessment).

The proposed Moura-Baralaba Road realignment will be completed off-lease, and the design of waterway crossings (culverts) will be undertaken in consideration of fish passage and water flow. The proposed road realignment crosses over one waterway mapped as low risk (green). Significant impacts to fish movement are not considered likely.

The proposed ETL is to occur outside the MLA; the infrastructure required for the ETL crosses six waterways; one moderate, four low and one at high risk of adverse impacts to fish movement. However, given the nature of the proposed infrastructure to be developed; these systems are not considered to be impacted by the proposed ETL. The proposed water release/extraction infrastructure and water pump station has been designed to primarily occur within the MLA and does not cross any waterways outside of the MLA.

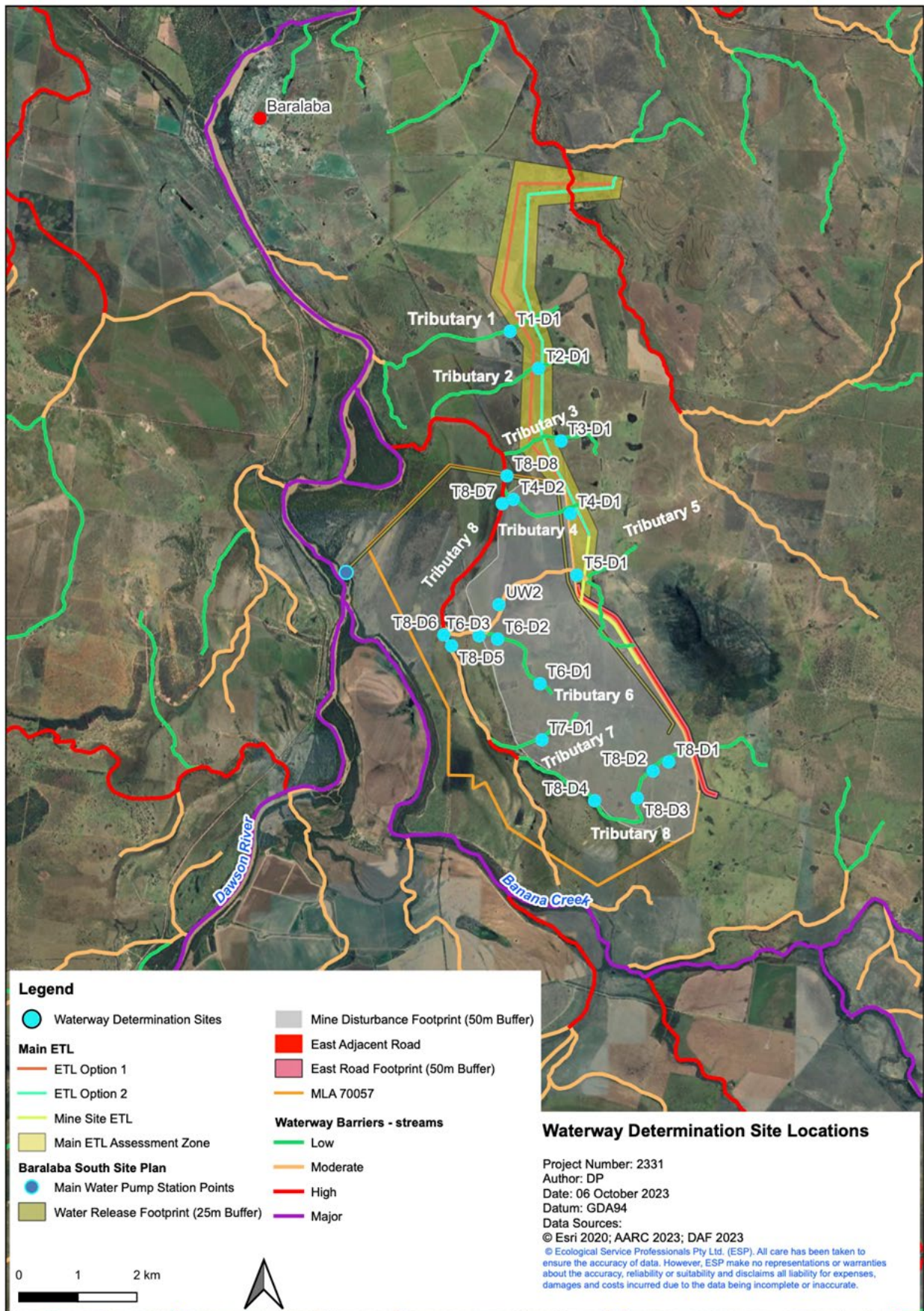


Figure 7.21: Waterway Barrier Works mapping



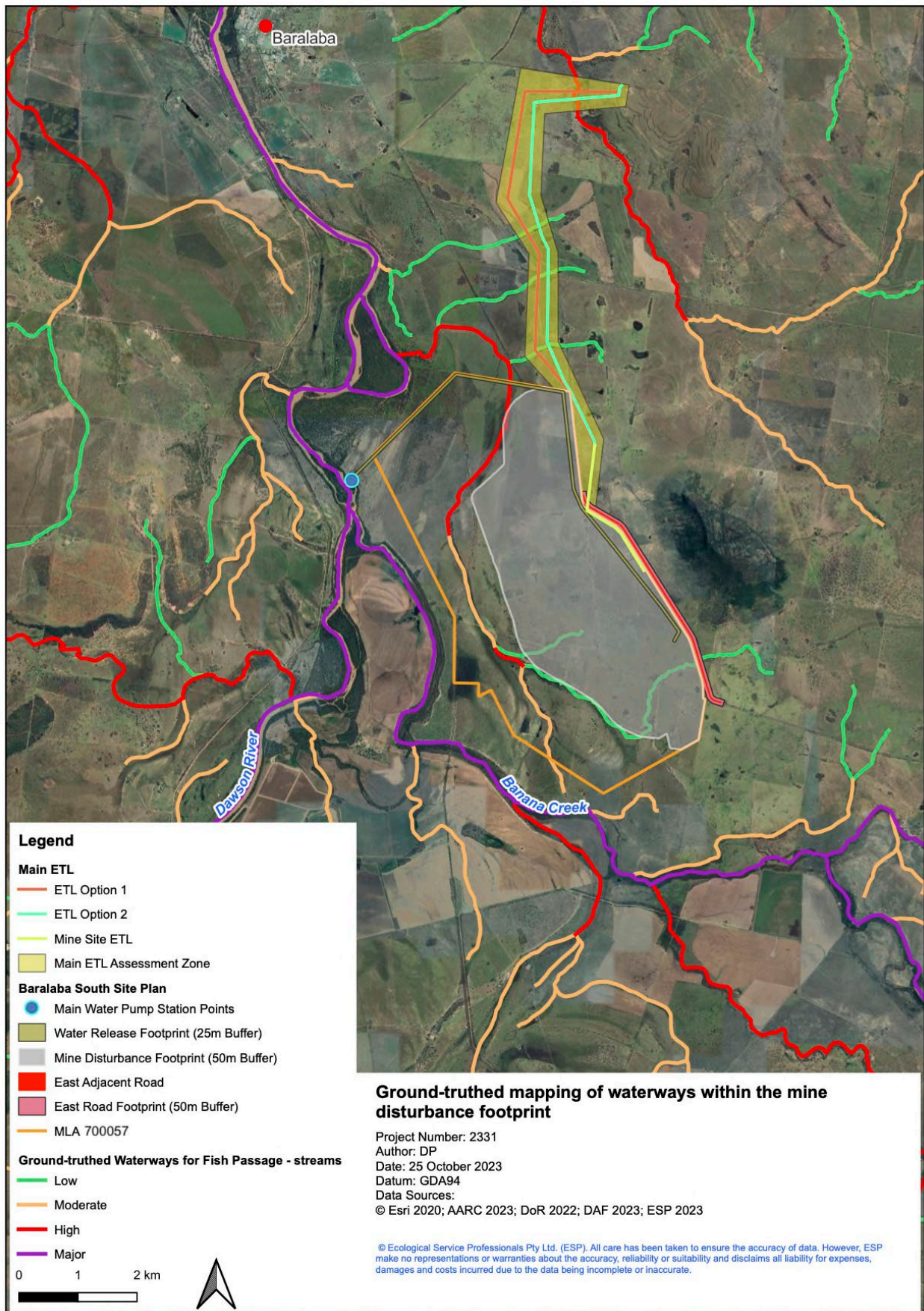


Figure 7.22: Ground-truthed mapping of waterways in the mine disturbance footprint

### 7.5.4 Water quality

A summary of water quality results from sites surrounding the Project area (major waterways) is presented in Table 7.12, while sites in the Project area (minor waterways and wetlands) are presented in Table 7.13. Parameters displayed are relevant to aquatic ecosystem health and determined water quality objectives (WQOs). The full suite of water quality sampling results undertaken during the aquatic ecology assessment is available in Appendix G. This section provides a brief summary of water quality in relation to flora and fauna values and is discussed in greater detail in Chapter 4, Surface Water.

Water quality in and around the Project area is typical of the region and indicates that the waterways and wetlands are 'moderately disturbed', being influenced by existing agricultural land uses and historic clearing.

Surveys in June 2017 and March 2018 revealed that waterways and wetlands within and around the Project area generally exhibit the following characteristics (Table 7.12 and Table 7.13):

- Electrical conductivity was typically below the WQO, with one Banana Creek site above the relevant objective in the June 2017 and August 2023 surveys, and the lacustrine wetland (dam) site above the relevant objective in the March 2018 and August 2023 surveys.
- pH was typically neutral and within the WQO range, except for the lacustrine wetland (dam) site that exhibited a consistent but slightly alkaline pH.
- Dissolved oxygen typically fell below the WQO range across minor waterways and wetlands in the Project area, as well as within major waterways around the Project area, except for the lacustrine wetland (dam) site that exhibited dissolved oxygen above the WQO in the August 2023 survey.
- Turbidity and total suspended solids were typically above the WQOs, both within and around the Project area, which is consistent with the greater region. This is frequently due to historic land clearing practices and erodible soils.
- Concentrations of ions were typically low, with one Banana Creek site above the relevant objective for sulphate in the June 2017 survey.
- Nutrient concentrations were typically higher, with most sites within and around the Project area recording levels above the relevant WQOs. This is consistent recordings within the greater region due to agricultural practices and runoff of fertilisers.
- Dissolved metal concentrations were typically below the limit of reporting, except for aluminium and copper that were occasionally elevated levels above the relevant WQOs within the Project area and in the surrounding catchment. There were frequent elevations around the Project area, as well as occasional elevations of iron in Shirley's Gully and Banana Creek and one elevation of chromium in the Dawson River.
- Total petroleum hydrocarbons were typically below the limit of reporting, with elevations above the relevant WQOs at three sites within and around the Project area in the June 2017 survey. All survey sites were below the limit of reporting in the March 2018 survey, suggesting that previous elevations were a likely result of recent and localised contaminations.



Table 7.12: Water quality surrounding the Project area

Parameter	Units	WQO	Upstream from or adjacent to Project area					Downstream from Project area								
			Jun-17	Mar-18	Aug 23	Jun-17	Mar-18	Jun-17	Mar-18	Jun-17	Mar-18	Aug-23	Jun-17	Mar-18	Aug-23	
			BC1			BC2		SG1			DA1			DR1		
<b>Physical</b>																
Temperature	°C	—	10.9	25.7	16.8	12.6	23.8	13.3	27.3	17.3	27.6	16.7	19	26.4	19.4	
EC	µS/cm	340 <sup>a</sup>	506	193.3	466.9	144	156.2	98.7	157.1	93	143.5	275.7	93.4	145.7	272.7	
pH	pH units	6.5-8.5 <sup>a</sup>	7.52	7.34	7.59	7.45	6.85	7.26	7.26	6.67	7.42	7.43	6.92	7.41	7.9	
Dissolved Oxygen (DO)	% sat.	85-110 <sup>a</sup>	63.7	64	85.9	91.1	6	85.4	46	42	74	71.1	35.3	67	94.3	
Turbidity	NTU	50 <sup>a</sup>	6	95.9	15.8	14	71.3	40	417.8	83	165.7	63.5	91	172.8	20.8	
Total Suspended Solids	mg/L	< 10 <sup>a</sup>	8	56	-	32	42	14	84	16	48	-	14	44		
<b>Ions</b>																
Sulphate	mg/L	< 25 <sup>a</sup>	35	< LOR	-	3	< LOR	5	2	4	2	1	4	2	-	
<b>Nutrients</b>																
Ammonia	µg/L	< 20 <sup>a</sup>	20	40	-	60	60	20	30	20	40	-	20	30	-	
Nitrite + Nitrate	µg/L	< 60 <sup>a</sup>	< LOR	< LOR	-	< LOR	< LOR	< LOR	90	160	250	-	170	250	-	
Total Organic Nitrogen	µg/L	< 420 <sup>a</sup>	980	1960	-	1140	1,740	780	1,230	480	860	-	480	770		
Total Nitrogen	µg/L	< 500 <sup>a</sup>	1,000	2000	-	1200	1,800	800	1,400	700	1200	-	700	1,000		

Parameter	Units	WQO	Upstream from or adjacent to Project area					Downstream from Project area								
			Jun-17	Mar-18	Aug-23	Jun-17	Mar-18	Jun-17	Mar-18	Jun-17	Mar-18	Aug-23	Jun-17	Mar-18	Aug-23	
			BC1			BC2		SG1			DA1			DR1		
Reactive Phosphorus	µg/L	< 20 <sup>a</sup>	< LOR	140	-	20	180	30	170	70	200	-	50	200	-	
Total Phosphorus	µg/L	< 50 <sup>a</sup>	50	570	-	130	530	180	450	150	350	-	150	370	-	
<b>Total Petroleum Hydrocarbons</b>																
C6–C9 Fraction	µg/L	20 <sup>b</sup>	< 20	< LOR	-	< 20	< LOR	< 20	< LOR	< 20	< LOR	-	< 20	< LOR	-	
C10–C36 Fraction (sum)	µg/L	100 <sup>b</sup>	< 50	< LOR	-	220	< LOR	< 50	< LOR	< 50	< LOR	-	< 50	< LOR	-	

Blue shading denotes values that are above the relevant WQO or WQO range.

Green shading denotes values that are below the relevant WQO range.

< LOR = below the laboratory limit of reporting.

<sup>a</sup> WQOs for Lower Dawson River sub-basin freshwaters (DEHP, 2011) used for comparison of waterway and palustrine wetland sites: DA1, DR1, BC1, BC2, UW1T, SG1 and PW2.

<sup>b</sup> Trigger Level for aquatic ecosystem protection outlined in DES, 2018b.

Table 7.13: Water quality within the Project area

Parameter	Units	WQO	Within Project area						
			Jun-17	Mar-18	Jun-17	Mar-18	Aug-23	Jun-17	Mar-18
			UW1T		LW1			PW2	
<b>Physical</b>									
Temperature	°C	—	14	Dry	15.9	27.6	20.5	9.6	25.4
EC	µS/cm	340 <sup>a</sup> , 250 <sup>b</sup>	88.1		158.9	294.4	437.7	136.8	236.3
pH	pH units	6.5–8.5 <sup>a</sup> , 6.5–8.0 <sup>b</sup>	7.15		8.49	8.47	8.61	7.01	7.01
DO	% sat.	85–110 <sup>a</sup> , 90–110 <sup>b</sup>	69.7		104	100	121.1	55.4	46
Turbidity	NTU	50 <sup>a</sup> , 1–20 <sup>b</sup>	123		22	20.3	15.5	62	110
Total Suspended Solids	mg/L	< 10 <sup>a</sup> , <sup>b</sup>	54		26	16	-	280	20
<b>Ions</b>									
Sulphate	mg/L	< 25 <sup>a</sup> , <sup>b</sup>	< LOR	Dry	< LOR	< LOR	-	< LOR	< LOR
<b>Nutrients</b>									
Ammonia	µg/L	< 20 <sup>a</sup> , < 10 <sup>b</sup>	70	Dry	160	80	-	60	40
Nitrite + Nitrate	µg/L	< 60 <sup>a</sup> , < 10 <sup>b</sup>	<LOR		<LOR	20	-	<LOR	<LOR
Total Organic Nitrogen	µg/L	< 420 <sup>a</sup> , < 330 <sup>b</sup>	1,880		2,040	2,120	-	2,540	1,260



Parameter	Units	WQO	Within Project area						
			Jun-17	Mar-18	Jun-17	Mar-18	Aug-23	Jun-17	Mar-18
			UW1T		LW1			PW2	
Total Nitrogen	µg/L	< 500 <sup>a</sup> , < 350 <sup>b</sup>	1,950		2,200	2,200	-	2,600	1,300
Reactive Phosphorus	µg/L	< 20 <sup>a</sup> , < 5 <sup>b</sup>	125		70	100	-	260	420
Total Phosphorus	µg/L	< 50 <sup>a</sup> , < 10 <sup>b</sup>	390		200	270	-	620	510
<b>Total Petroleum Hydrocarbons</b>									
C6–C9 Fraction	µg/L	20 <sup>c</sup>	< 20	Dry	< 20	< LOR	-	< 20	< LOR
C10–C36 Fraction (sum)	µg/L	100 <sup>c</sup>	225		< 50	< LOR	-	180	< LOR

**Blue** shading denotes values that are above the relevant WQO or WQO range.

**Green** shading denotes values that are below the relevant WQO range.

<LOR below the laboratory limit of reporting.

a WQOs for Lower Dawson River sub-basin freshwaters (DEHP, 2011) used for comparison to waterway and palustrine wetland sites: DA1, DR1, BC1, BC2, UW1T, SG1 & PW2.

b WQOs for Lower Dawson River sub-basin freshwater lakes/reservoirs (DEHP, 2011) used for comparison to lacustrine wetland (dam) site LW1.

c Trigger levels for aquatic ecosystem protection outlined in DES 2018b.

### 7.5.5 Sediment quality

Sediment quality within and around the Project area is moderate to good, with sampling results detailed in Appendix G, Aquatic Ecology Assessment. The concentrations of most parameters, as indicated in surveys undertaken in June 2017 and March 2018, were below the default guideline values, where available, except for:

- nickel concentrations that were above the default guideline values (but below the 'upper' guideline values) at sites in Shirley's Gully and Banana Creek (June 2017) and in Dawson River Anabranh (March 2018); and
- total petroleum hydrocarbon concentrations that were above the default guideline values (but below the guideline values-high) in one Banana Creek site (June 2017 and March 2018) and above the guideline values-high in the palustrine wetland (i.e. HES wetland) (June 2017 and March 2018).

### 7.5.6 Macroinvertebrates

No listed threatened macroinvertebrate or macrocrustacean species were recorded during field surveys for the Project. No threatened macroinvertebrate or microcrustacean species are known to occur in the Dawson River sub-basin, and none have been recorded in previous surveys of the region in the Dawson River or surrounding waterways and wetlands (Appendix G, Aquatic Ecology Assessment).

#### 7.5.6.1 Taxonomic richness

A total of 52 taxa (June 2017) and 56 taxa (March 2018) were recorded in the Aquatic Ecology Assessment (Appendix G). In both surveys, taxonomic richness was greater in edge samples (48 and 47 taxa, respectively) than in bed samples (32 and 41 taxa, respectively). However, taxonomic richness was generally low in edge habitat (Figure 7.23) when compared to the WQOs but generally low to moderate in bed habitat (Figure 7.24).

The most common and widespread major groups and taxa in both edge and bed habitat were all typical of the region and generally classified as tolerant to very tolerant pollution tax (where sensitivity ratings were available). However, three sensitive taxa of Mayflies (order Ephemeroptera—namely, the families Baetidae, Caenidae and Leptophlebiidae) were also widespread in both edge and bed habitats. Three additional sensitive taxa of caddisflies (order Trichoptera—namely, families Ecnomidae, Hydroptilidae and Leptoceridae) were moderately widespread in edge and bed habitats in June 2017. The taxa were less common in March 2018 and were only present (in both edge and bed habitat) at two sites in the Dawson River and the Dawson River Anabranh. The least widespread taxa across the assessment in both habitats consisted of 'tolerant' and 'very tolerant' taxa.

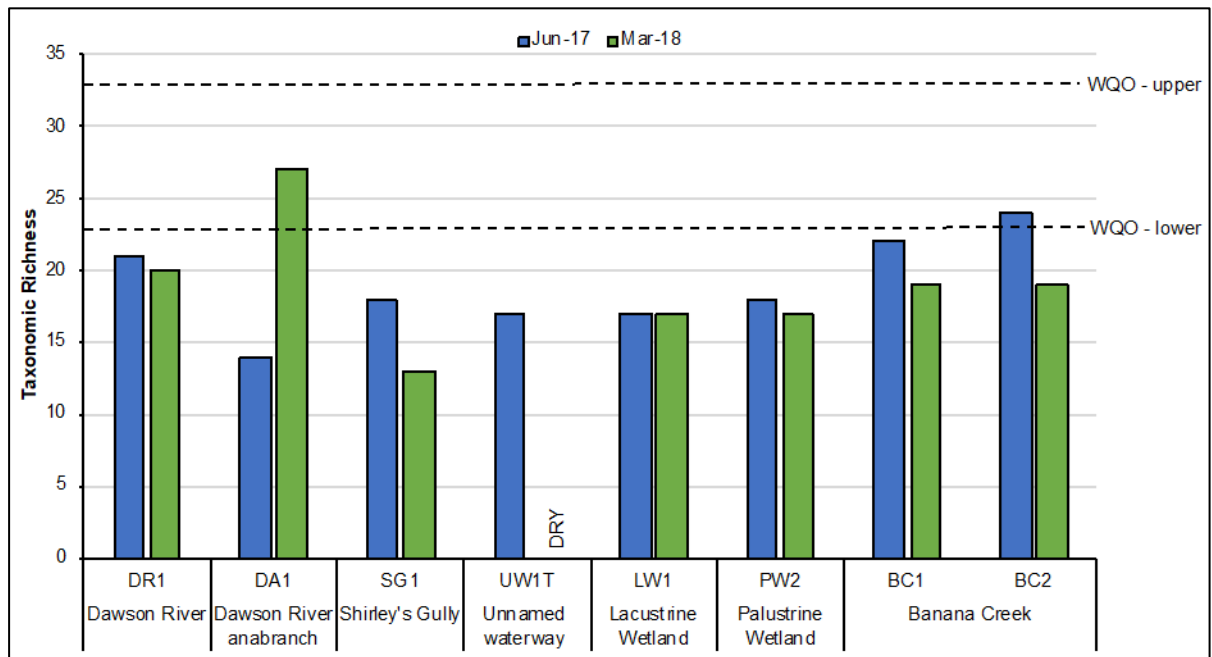


Figure 7.23: Taxonomic richness for edge habitat at each site

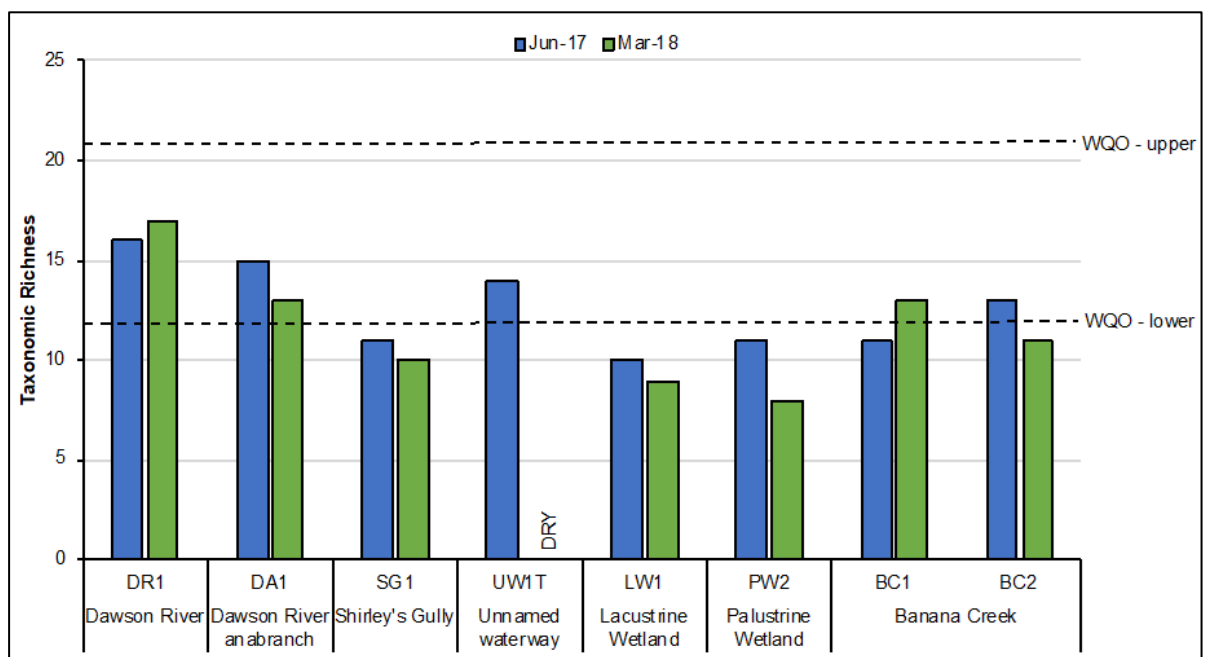


Figure 7.24: Taxonomic richness for bed habitat at each site

### 7.5.6.2 PET richness

Macroinvertebrates belonging to the PET (Plecoptera, Ephemeroptera and Trichoptera) orders are considered to be particularly sensitive to changes in their environment. A total of six PET taxa were identified across the assessment. PET richness was typically low to moderate across all sites and habitat types (Figure 7.25 and Figure 7.26), and summarised as:

- wetland sites had a PET richness consistently below the WQO range throughout the assessment;



- minor waterway sites had a PET richness consistently equal to or below the WQO range throughout the assessment;
- Banana Creek sites had a PET richness equal to or below the WQO range in edge habitat and below the WQO range in bed habitat; and
- the Dawson River and Anabranh sites had a PET richness consistently equal to the lower WQO or within the WQO range throughout the assessment.

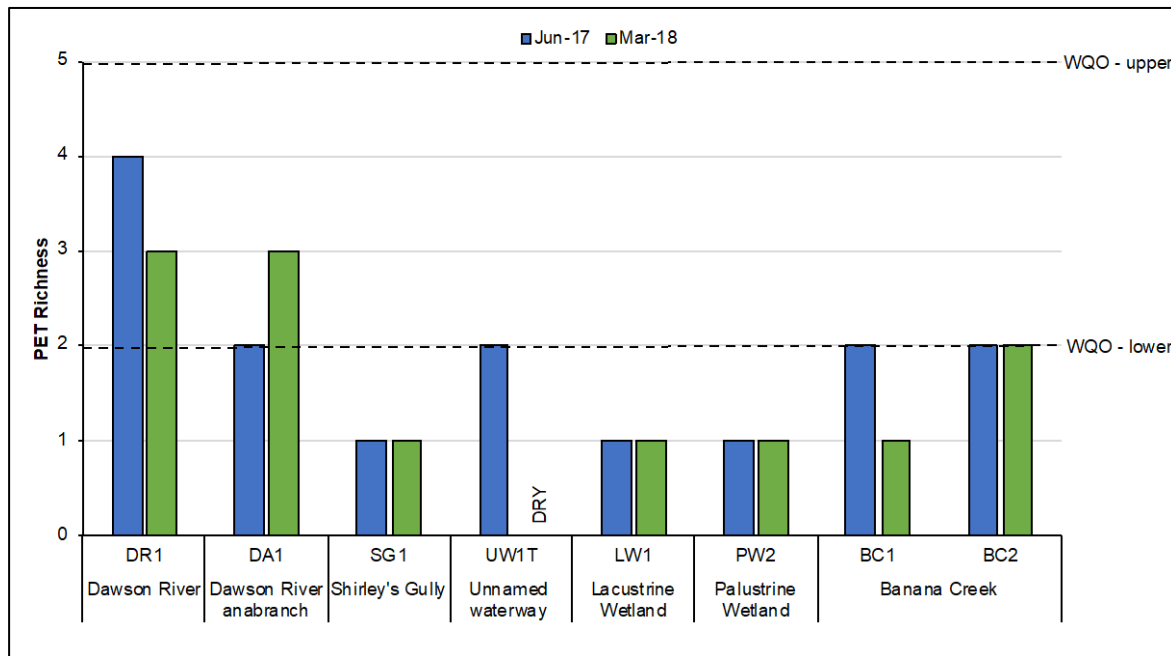


Figure 7.25: PET richness for edge habitat at each site

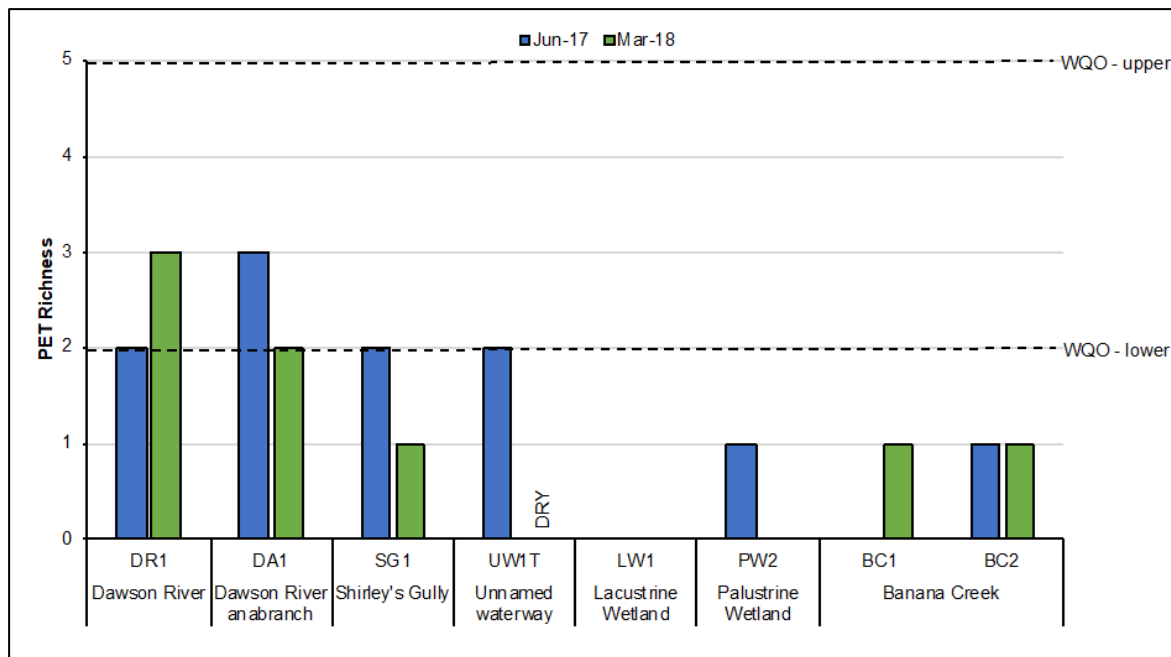


Figure 7.26: PET richness for bed habitat at each site

### 7.5.6.3 SIGNAL 2 Scores

SIGNAL 2 scores in edge habitat were low with all sites below the WQO range throughout the assessment, except for one site (BC2) on Banana Creek in March 2018. SIGNAL 2 biplots for macroinvertebrate communities in edge habitat indicated the following:

- site conditions for most sites are likely influenced by urban industrial or agricultural pollution; and
- two sites (BC2 in June 2017 and DA1 in March 2018) indicated high concentrations of nutrients and/or high turbidity and salinity.

Water quality data supports this outcome, with high concentrations of nutrients recorded at all sites typical of waterways surrounded by agricultural land.

SIGNAL 2 scores in bed habitat varied with sites in wetlands and Banana Creek being below the WQO range, except for PW2 and BC2 in March 2018. Sites on the Dawson River and the Dawson River Anabranche were below the WQO range in June 2017 but within the WQO range in March 2018, while results from the minor waterways were within the WQO range.

SIGNAL 2 biplots for macroinvertebrate communities in bed habitat sites indicated pollutants from surrounding land runoff or, potentially, natural sources of contaminants may be affecting conditions at sites and, as a result, impacting macroinvertebrate communities. Water quality data supports this, with high concentrations of nutrients recorded at all sites, which is typical of waterways surrounded by agricultural land. Additionally, poor physical conditions (such as bare muddy beds) can also result in sites falling within quadrants 3 and 4 (quadrant 3 is indicative of toxic pollution and harsh physical conditions, while quadrant 4 is indicative of urban, industrial or agricultural pollution, or downstream effects of dams). Quadrant 1 is indicative of favourable conditions, and while some sites fell within this quadrant, their position was borderline with quadrant 2, indicating that external factors were still influencing the conditions at these sites to some degree.

### 7.5.7 Aquatic flora

Aquatic flora of the Fitzroy River basin is generally sparse with a low diversity of species, which has been attributed to the naturally harsh environmental conditions of ephemeral waterways. The aquatic plant species recorded within and around the Project area are typical of the region and indicate a low to moderate diversity and abundance of aquatic flora in the aquatic ecology study area. A total of 32 species of plants from 20 families were recorded across both surveys with most native species recorded recognised as wetland indicator species (Appendix G, Aquatic Ecology Assessment).

Species richness was highest in the GES palustrine wetlands within the Project area during both surveys with a variety of aquatic plants of different growth forms (submerged, floating and emergent) recorded, while the sites on unnamed waterways and the HES palustrine wetlands had the lowest species richness.

#### 7.5.7.1 Aquatic flora species of conservation significance

Four species of threatened aquatic plants are known to occur in the Dawson River sub-basin and include:

- 1) *Thelypteris confluens*—vulnerable (NC Act);
- 2) sub-species of Salt Pipewort (*Eriocaulon carsonii* subsp. *carsonii*)—endangered (EPBC Act, NC Act);
- 3) sub-species of Salt Pipewort (*Eriocaulon carsonii* subsp. *orientale*)—endangered (EPBC Act, NC Act); and
- 4) Swamp-orchid (*Phaius australis*)—endangered (EPBC Act, NC Act).

No listed threatened aquatic plants were recorded during the field surveys. There are no published records of listed threatened aquatic flora species occurring within 10 km of the Project area.

### 7.5.7.2 Pest aquatic plants

Two flora species listed as restricted invasive species under the *Biosecurity Act* with a control category of 3 were recorded during field surveys on the Dawson River and Shirley's Gully; these species were not recorded within the Project area. These species are:

- Olive Hymenachne (*Hymenachne amplexicaulis*) – also listed as WoNS; and
- Water Lettuce (*Pistia stratiotes*).

Most waterways had low coverage of instream aquatic plants with low diversity and coverage of floating and submerged species recorded, except at the GES palustrine wetlands. The low abundance and diversity present suggest the impacts are due to surrounding land uses (cattle grazing, trampling and broad acre cropping) and harsh physical conditions (i.e. drought and erosion) (Appendix G, Aquatic Ecology Assessment).

### 7.5.8 Aquatic fauna

A total of 21 species of fish have been recorded within and around the Project area (Appendix G, Aquatic Ecology Assessment). Fish communities are typical of the Fitzroy Basin and Dawson River sub-basin, characterised by common and widespread species. Within the Project area, diversity is low, while the major waterways surrounding the Project area support a higher biodiversity including three species endemic to the Dawson River sub-basin: Southern Saratoga (*Scleropages leichardti*), Leathery Grunter (*Scortum hillii*) and Golden Perch (*Macquaria ambigua*). Banana Creek and Shirley's Gully provide fish breeding habitat and refuge during high-flow periods in the Dawson River.

Two species of turtles considered widespread and common throughout waterways in Queensland were recorded in the Project area including Krefft's River Turtle (*Emydura krefftii*) and Saw-Shelled Turtle (*Wollumbina latisternum*). These species are known in the region and have been previously recorded in surveys of the Dawson River and surrounding waterways and wetlands. No turtle nests have been observed within the study area.

#### 7.5.8.1 Aquatic fauna species of conservation significance

Desktop assessments returned five listed aquatic fauna species under the EPBC Act and/or the NC Act as known or having potential to occur within the region of the Project. These five species were targeted during the March 2018 field surveys:

- Fitzroy River Turtle (*Rheodytes leukops*)—vulnerable (EPBC Act, NC Act);
- Murray Cod (*Maccullochella peelii*)—vulnerable (EPBC Act);
- Platypus (*Ornithorhynchus anatinus*)—special least concern (NC Act);
- Silver Perch (*Bidyanus bidyanus*)—critically endangered (EPBC Act); and
- White-throated Snapping Turtle (*Elseya albagula*)—critically endangered (EPBC Act, NC Act).

At the time of the EPBC Act Controlled Action Decision (EPBC Referral 2012/6547), only the Fitzroy River Turtle and the Murray Cod were listed as threatened species under the EPBC Act. Therefore, the White-throated Snapping Turtle and the Silver Perch are not considered as MNES for the Project. The White-throated Snapping Turtle is listed as critically endangered under the NC Act and is subject to State assessments.

No listed threatened aquatic fauna species were recorded within the Project area during the aquatic ecology assessment, and all potential species identified during the desktop assessment were determined to have a low likelihood of occurrence in the waterways of the Project area due to lack of suitable habitat and connectivity (Appendix G, Aquatic Ecology Assessment).



### 7.5.8.2 EPBC Act listed species

#### *Fitzroy River Turtle*

The Fitzroy River Turtle is listed as vulnerable under both the EPBC Act and the NC Act.

The Fitzroy River Turtle is endemic to the Fitzroy River basin in Queensland and occurs widely within the permanent water habitats of the middle and lower reaches of the Fitzroy, Dawson, Mackenzie, and Comet rivers and associated tributaries (Limpus *et al.*, 2011).

There are several records of the species from the Dawson River in the surrounding region, including:

- a living record 70 km downstream of the Project area, near the town of Boolburra;
- a partial skull collected from the Moura Weir 45 km upstream of the Project area (ALA, 2019). It is difficult to ascertain whether this specimen was washed downstream and simply recovered from this location;
- downstream of Neville Hewitt Weir, 20 km downstream of the Project; and
- the Neville Hewitt Weir (unpublished) (Venz *et al.*, 2002; Limpus *et al.*, 2011), although it is difficult to determine if these records represent a relictual population persisting in unfavourable conditions or a healthy breeding population.

Records of occurrence and modelled distribution of the species around the Project area are shown on Figure 7.27. The species has only been recorded in waters of the Dawson River main channel, and not in any of the smaller waterways in the region likely due to lack of habitat.

No Fitzroy River Turtles or suitable habitat for the species were identified in the Project area during the surveys and these waterways are not considered to support suitable habitat for the species.

Although no individuals of the species were recorded during the surveys, in the Dawson River, Dawson River Anabranche, Shirley's Gully or Banana Creek, these areas provide potential suitable habitat to support the species, including permanent pool habitat and available instream structure for resting / refuge. The habitat within these watercourses adjacent to and downstream of the Project is characterised by a large, deep weir pool created by the Neville Hewitt Weir downstream of the Project. Although these waterways do not provide the preferred / key riverine habitat characteristics such as pool and riffle sequences, diversity of substrate and habitat types in the vicinity of the site, they may provide some suitable habitat features and individuals have previously been recorded here. Potential nesting banks were recorded on the well-vegetated earthen banks of the Dawson River and Anabranche but not within Banana Creek or Shirley's Gully.

Given the species was not recorded during the field surveys and preferred habitat does not occur in the Project area, the species is only considered to transiently use the areas adjacent to the Project area.

An assessment of the potential Project impacts on the Fitzroy River Turtle is detailed in section 7.10.1.8 and Chapter 9, Matters of National Environmental Significance.

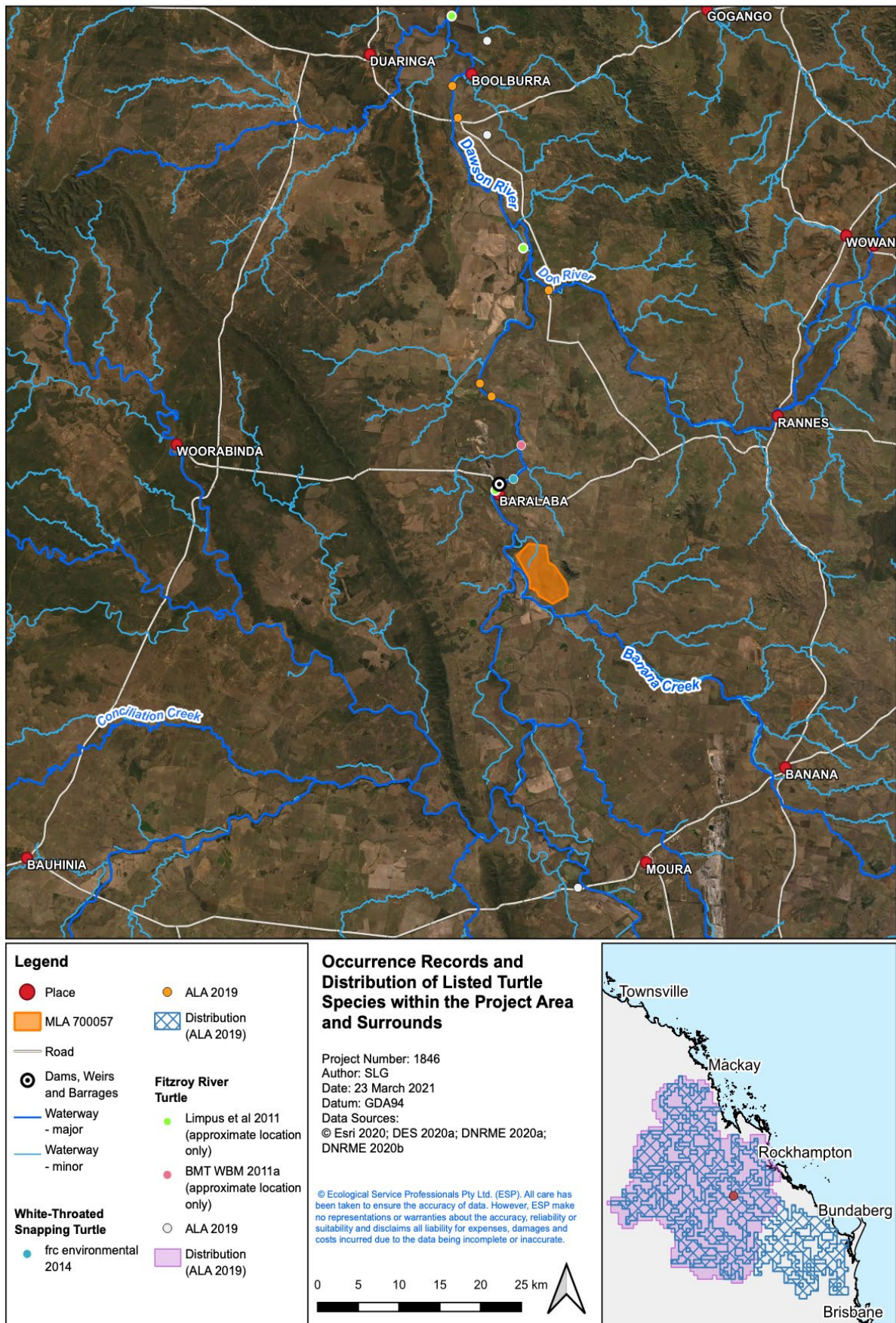


Figure 7.27: Occurrence records and distribution of listed turtle species within the Project area and surrounds

### *Murray Cod*

The Murray Cod is listed as vulnerable under the EPBC Act.

The Murray Cod occurs naturally in the warm water habitats of the Murray Darling basin, extending from southern Queensland through New South Wales, Australian Capital Territory, Victoria and South Australia. The Murray Cod has been translocated into the Fitzroy River basin and stocked in several dams across Queensland.

There are no published records of the Murray Cod in the vicinity of the Project area or within the Dawson River sub-basin (DES, 2023; ALA, 2023). The closest published records of this species are in the Condamine-Balonne sub-basin, approximately 290 km south-east of the study area, and Lake Maraboon in the Nogoa River sub-basin, approximately 210 km to the north-west of the Project area.

No Murray Cod were recorded during previous surveys completed on the Dawson River and surrounding waterways and wetlands in the region (Appendix G, Aquatic Ecology Assessment). This species is considered unlikely to occur in the vicinity of the Project area.

Given the species is unlikely to occur within the study area, potential impacts to this species are not considered further in this assessment.

#### **7.5.8.3 NC Act listed species**

### *White-throated Snapping Turtle*

The White-throated Snapping Turtle is listed as endangered (NC Act).

The closest published record of the White-throated Snapping Turtle is in the Dawson River approximately 25 km downstream, and 80 km upstream near Moura (ALA, 2019). White-throated Snapping Turtles were recorded at a site on the Dawson River 10 km downstream of the Project area during surveys undertaken for the Baralaba North Project (Appendix G, Aquatic Ecology). This species has only been recorded in waters of the Dawson River main channel and not in any of the smaller waterways in the region likely due to lack of habitat.

No White-throated Snapping Turtles or suitable habitat were recorded during the field surveys likely due to the limited preferred habitat features (as described for the Fitzroy River Turtle). Potential impacts on this species as a result of the Project are considered at a state level for this species.

The potential for the Project to impact this species has been assessed in section 7.10.2.11 of this chapter.

### *Platypus*

The Platypus is listed as a special least concern species under the NC Act.

No Platypus were identified at any of the survey sites and no evidence of Platypus (such as burrows) was observed. The Dawson River and Anabranche, Banana Creek and Shirley's Gully contain suitable habitat to support this species, including permanent pool habitat and available instream structures for resting /refuge. However, these systems are not considered ideal as they lack several of the preferred habitat features of the Platypus (i.e. clear, flowing water with coarse bed substrates (e.g. cobble and gravel), riffle zones and dense coverage of submerged aquatic vegetation).

The banks at these sites are considered suitable for burrows, however, no burrows were observed during field surveys. There is a low likelihood that Platypus would occur in these waterways in the aquatic ecology study area, given the habitat requirements and distribution range of Platypus (Appendix G, Aquatic Ecology Assessment).

An assessment of the potential Project impacts on the Platypus is in section 7.10.2.10 of this chapter.



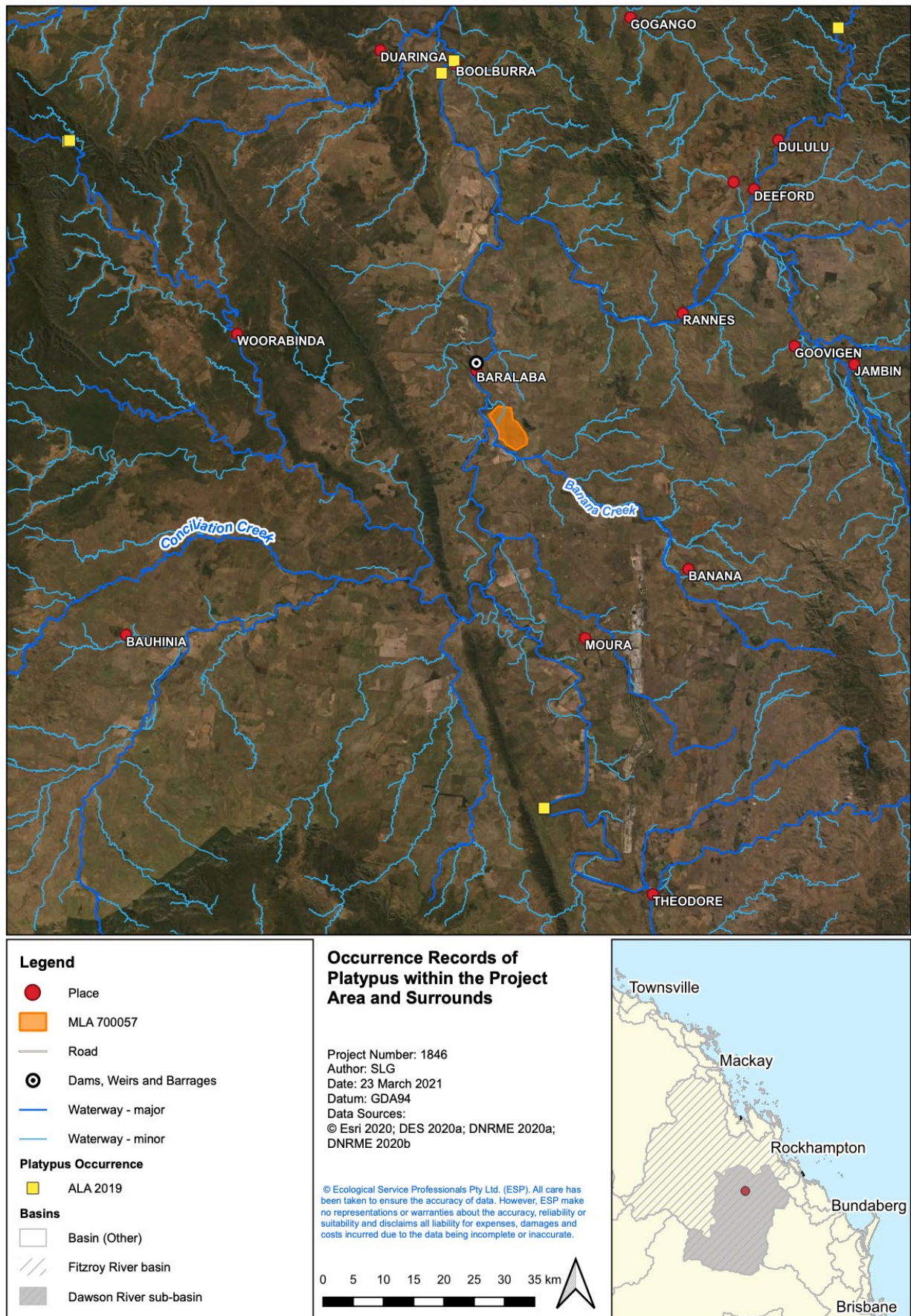


Figure 7.28: Occurrence records of Platypus within the Project area and surrounds

#### 7.5.8.4 Declared aquatic pests

Two pest species of fish were recorded during the aquatic ecology surveys, specifically Mosquitofish (*Gambusia holbrooki*) and Goldfish (*Carassius auratus*). Mosquitofish are listed as a restricted biosecurity matter and as a noxious fish species under the *Biosecurity Act*. Goldfish are a fish species non-indigenous to Australia. Both the Mosquitofish and Goldfish are known to occur throughout the Fitzroy River basin and the Dawson River sub-basin. No other aquatic pest fauna species were observed during the field surveys.

## 7.6 Groundwater dependent ecosystem ecological values

No aquatic or subterranean GDEs are mapped within the ML or adjacent areas. The terrestrial vegetation associated with the Dawson River and Banana Creek adjacent to the Project area is mapped as having low potential (at a regional scale) to be dependent on subsurface expressions of groundwater i.e. a terrestrial GDE.

Water held in the regional alluvial aquifer is mostly an unsuitable resource to support GDEs due to high levels of salinity, and considerable depth to the water table (greater than 10 m). Exceptions occur directly adjacent to a stream channel where bank recharge with fresh surface water can occur, and channel incision decreases the depth to the groundwater table. Groundwater dependency in the Project area and adjacent areas associated with the Dawson River flood plain is controlled by small discontinuous lenses of sand that are distributed sporadically throughout the heavy clay soils that otherwise characterise the flood plain sediments.

GDEs identified, are all associated with overland flow paths of the main Dawson River channel, which would act to increase infiltration into the soil profile due to prolonged ponding of surface water. The sandy lenses support shallow, fresh and seasonal groundwater resources that are perched above and disconnected from the regional groundwater table. Recharge of the sandy lenses occurs during surface water infiltration, which is associated with overbank flow and intense rainfall events, and seasonality will depend on climatic factors including transpiration rates and flood interval.

The field results found considerable variation in the leaf water potential (LWP) measurements between GDE assessment areas, with LWP measures from four GDE areas indicative of potential utilisation of a source of fresh, saturated soil moisture. These were GDE Area 1, GDE Area 6, GDE Area 9 and GDE Area 10, although GDE Area 5, GDE Area 7 and GDE Area 8 may be indicative of saline groundwater usage. Other localities present LWP values that are too low for the local groundwater salinity regime or are associated with groundwater salinity that is too high to represent a viable source of moisture for transpiration (Appendix H, Groundwater Dependent Ecosystem Assessment).

Stable isotope analysis indicates only three of the assessment sites present strong evidence of groundwater utilisation, these being:

- GDE Area 1: which is formed by an overflow channel which links Banana Creek to the Dawson River across the Dawson River floodplain. This is a relatively restricted linear area (7.2 ha) of mature riparian vegetation that is classified as RE 11.3.3 (high-value regrowth) (Appendix F, Terrestrial Ecology Assessment). The ecohydrological characteristics of this site indicate relatively low soil matric potentials in the upper 4.8 m of the soil profile. With evidence from high LWP values, the negative SMP results provide physical evidence of a sandy lens at depth. This sand is inferred to be a seasonal aquifer that is perched above the more saline regional groundwater table. Stable isotope analysis of twig samples indicates strong similarity to groundwater water samples providing three lines of evidence supporting this locality as being groundwater dependent.
- GDE Area 6: on the main channel of Banana Creek, provides evidence for a zone of high-water availability below the upper soil profile which is characterised by thick plastic clay with low matric potential. The zone of high-water availability is inferred to be a sandy interval which lies directly beneath the river channel, below the depth of the Auger hole (installed to 3.3 mbgl). Based on LWP measurements, the sandy interval is saturated or near saturated and would be directly recharged during river flow. It is expected that any sandy interval would be centred along the river channel and would subtend the river terraces laterally in discontinuous pockets. This assessment is supported by stable isotope analysis which indicates the water



source utilised by trees is of similar isotopic composition to surface water in the Neville Hewitt weir, consistent with groundwater recharge associated with channel flow.

- GDE Area 10: which presents as a flood overflow channel on the upper alluvial terrace of the Dawson River floodplain. The overflow channel is proximal to and flows parallel to the Dawson River (Neville Hewitt Weir). The high LWP values are causally linked to a sandy soil horizon that was intersected during auger profiling. Groundwater dependence is confirmed by overlap of stable isotope signatures extracted from twigs with the isotopic composition of groundwater samples.

These GDE sites are all attributed to sandy intervals in the soil profile which, in the case of GDE Area 1 and GDE Area 10, would be recharged during overbank flow events where overflow channels distribute floodwaters across the floodplain. The period of saturation in the sandy intervals would be seasonal; dependent on the period between flood events and climatic regimes which influence transpiration rates. For these GDE areas, it is also likely that the sandy horizon is perched above, and hydraulically disconnected from the regional alluvial aquifer. For GDE Area 6, saturation of the sandy profile would more likely be permanent or near permanent due to direct hydraulic connectivity with surface water in the stream channel.

For all these assessment areas, it is noted that adjacent assessment areas do not demonstrate the likelihood of groundwater dependency. This is particularly notable in GDE Area 10, where three adjacent sites all demonstrate LWP results indicative of relative water deficit suggesting moisture utilisation from hydraulically tight clays in the vadose zone.

In summary, the GDE assessment concluded that:

- There are no springs or seeps in the Project area.
- Groundwater dependency of vegetation across the floodplain is linked to the hydraulic capacity of substrates in the deeper soil profile with sandy lenses / interbeds hosting groundwater on a seasonal basis. Where these sandy lenses interact with mature flood plain vegetation, seasonal groundwater dependence is implied.
- The sandy interbeds in the soil profile have a restricted and discontinuous distribution beneath the flood plain surface and there is no evidence of hydraulic connectivity between sandy lenses.
- Riparian vegetation that occupies major riverine channels does not necessary imply groundwater dependence and there are extensive areas, both within and fringing the channels of Dawson River and Banana Creek, that are reliant on soil moisture held by clays in the vadose zone.
- It is not possible to infer the exact extent and location of these discontinuous sandy lenses though it can be inferred that they are discontinuous and limited in extent. The potential distribution of vegetation that may be reliant on seasonal groundwater resources held in sandy lenses is shown in Figure 7.29, which greatly exaggerates the extent of groundwater dependent vegetation.
- The HES wetland is not considered to be groundwater dependent. The wetland is considered to be reliant on surface water inflow (i.e. direct rainfall, runoff and floodwaters) that are held near the surface by the underlying shallow clay substrate and the wetland is not dependent on groundwater.
- The Coolabah woodland that occupies the upper terraces of the Dawson River flood plain is not considered to be a GDE. Due to the depth and salinity of the alluvial aquifer across the broader flood plain, coupled with the heavy clay soils that pose an impediment to deep tap root penetration, it is considered unlikely that the Coolabah woodlands which dominate remnant vegetation on the floodplain have capacity to utilise the regional alluvial aquifer.
- Sandy lenses appear to be restricted to localities directly below the river channel, or where overflow flood channels traverse the floodplain creating flood depressions. It is important to note that not all areas associated with the flood channels of either the Dawson River, or Banana Creek are considered groundwater dependent.
- Sandy intervals that may be associated with the soil profile below major river channels are likely to be permanently saturated due to hydraulic connectivity with surface flows, and these also provide a source of moisture for groundwater dependent species including river red gum which occupy inner benches on



major drainage channels. Like the sandy lenses that are conceptualised as having a localised occurrence beneath the flood plain, there is no evidence that sandy intervals below the drainage channel have any extensive medial or lateral continuity.

A conceptual model of the Dawson River floodplain, illustrating the ecohydrological function of vegetation in relation to sandy lenses, seasonal bank and aquifer recharge during post-wet season, flooding/overbank flow, and late dry season scenarios is shown in Figure 7.30, Figure 7.31 and Figure 7.32 with the location of the various cross-sections indicated in Figure 7.29.

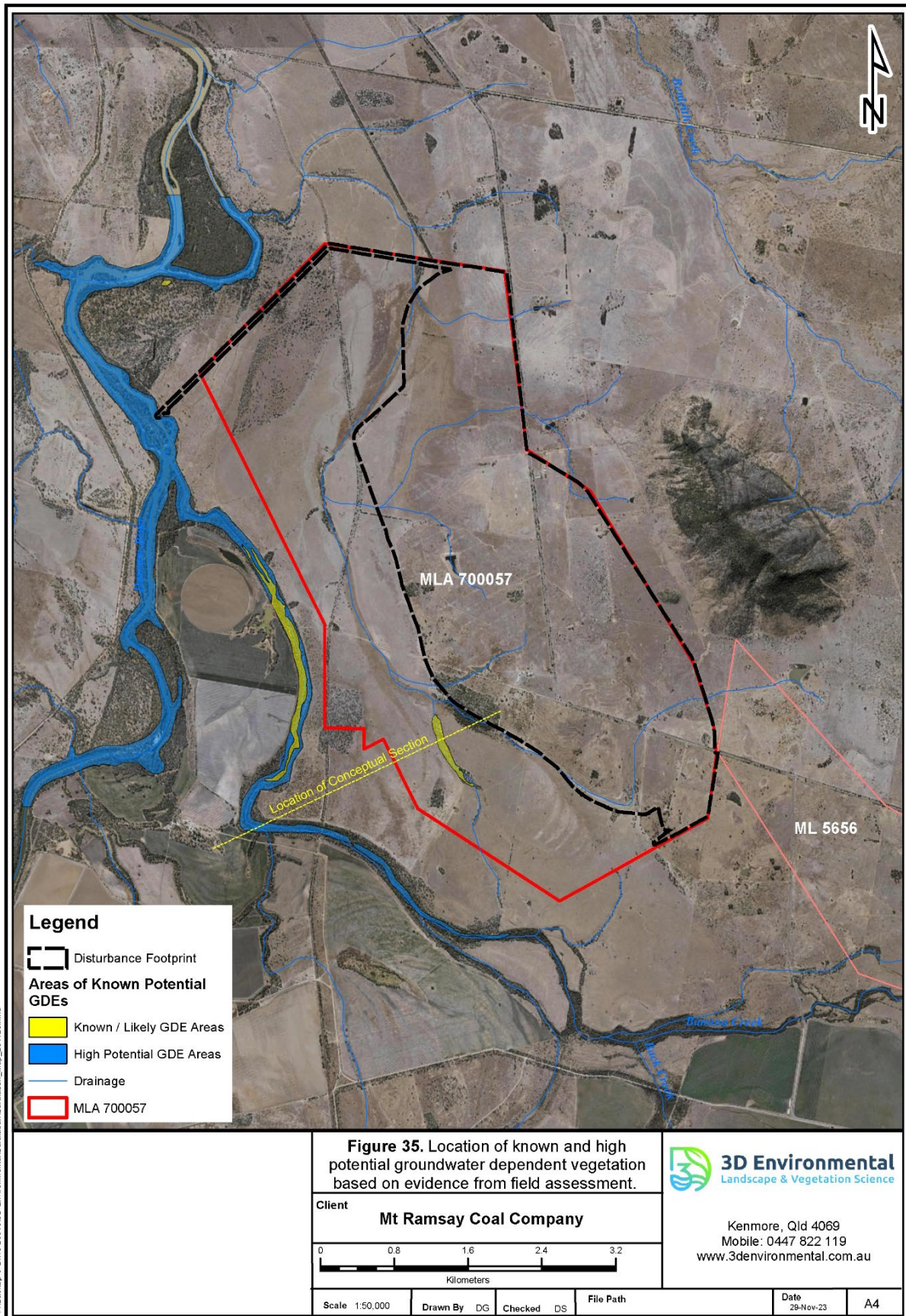


Figure 7.29: Location of the extent of potentially groundwater dependent vegetation based on evidence from field assessment

**Banana Creek - Surface Flow**

Generally post wet season to post wet season from November through to June

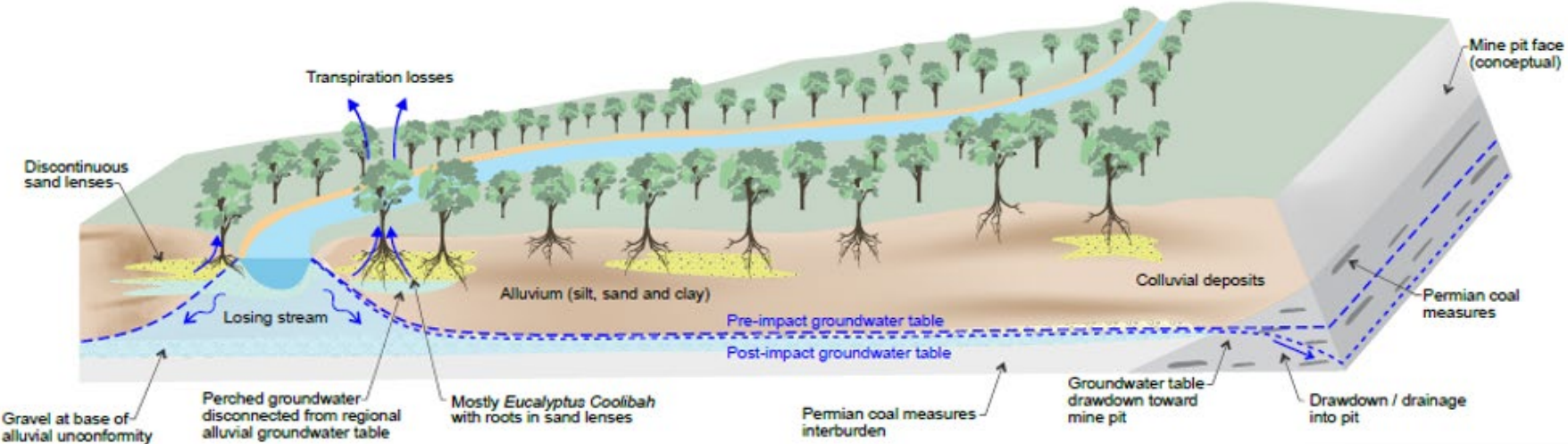


Figure 7.30: Ecohydrogeological conceptual model of the Dawson R. flood plain at its confluence with Banana Ck. – surface flow conditions



### **Banana Creek - Wet Season Overbank Flows**

Typically occurring post high rainfall events from November to April

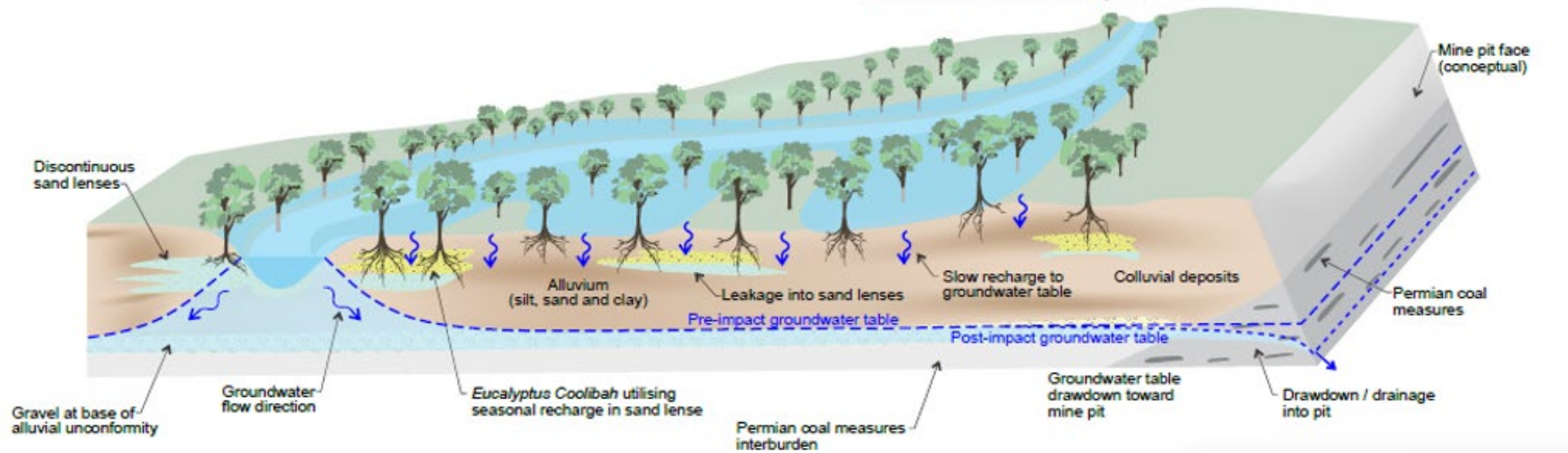


Figure 7.31: Ecohydrogeological conceptual model of the Dawson R. flood plain at the confluence of Banana Ck. - bank overflow conditions

**Banana Creek - Low/No Flow (Disconnected Creek)**

Dry and drought periods typically from April to November

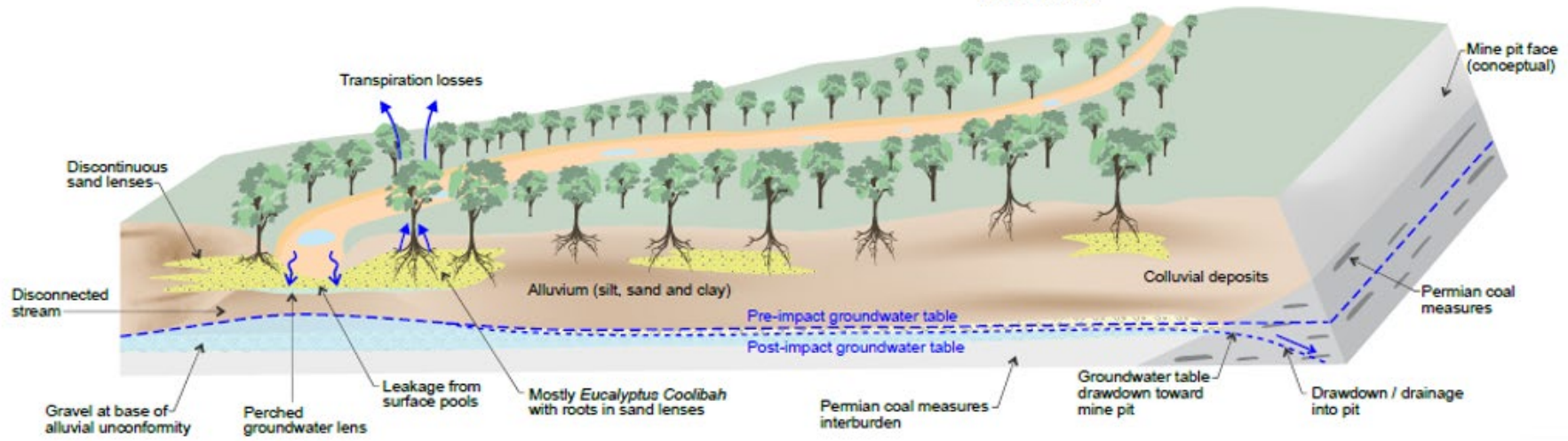


Figure 7.32: Ecohydrogeological conceptual model of the Dawson R. flood plain at the confluence of Banana Ck. – low/no flow conditions

## 7.7 Stygofauna ecological values

### 7.7.1 Background stygofauna ecology

Stygofauna are animals that live in groundwater and consist of invertebrates including crustaceans, worms, snails, mites and insects. Stygofauna use inputs of organic matter from the surface to provide the basis of the food web and through this process stygofauna play an important part in maintaining groundwater quality.

Stygofauna can be categorised into four types, relative to their dependence on groundwater systems, as follows (Appendix I, Stygofauna Assessment):

- Stygobites and phreatobites are stygofauna that are completely dependent on groundwater.
  - Stygobites are obligate subterranean species, restricted to groundwater systems.
  - Phreatobites are stygobites that are restricted to the deep groundwater substrata of alluvial aquifers.
- Stygoxenes and stygophiles are stygofauna that can live in within surface water or groundwater systems.
  - Stygoxenes are stygofauna that have no affinity with groundwater systems but are regularly recorded in caves and alluvial sediments. Stygoxenes include planktonic groups and a variety of benthic crustacean and insect species which passively infiltrate alluvial sediments (Gilbert *et al.*, 1994).
  - Stygophiles are stygofauna that actively utilise groundwater system resources and/or actively seek protection from unfavourable surface water conditions.

### 7.7.2 Aquifer characteristics

The main aquifer units of the Project area include the Dawson River alluvium and the underlying Permian Blackwater Group Coal Measures.

Previous studies (SKM, 2014) have identified stygofauna (Cyclopoida Copepoda and a damaged mite) in the alluvium but concluded that there were no stygofauna present within the Permian coal measures, which is consistent with other regional studies. As such, the stygofauna assessment (Appendix I, Stygofauna Assessment) focused on the Dawson River alluvium.

The Dawson River alluvium is a shallow groundwater system with water levels during the survey period between 19.93- 8.07 mbgl. Groundwater elevation was highest near the Dawson River at bores A-OB12, A-OB11, A-OB1, A-OB2 and A-OB3 and reduced with increasing distance from the Dawson River. Groundwater EC ranged between 327.7  $\mu\text{S}/\text{cm}$  (A-OB12) to 40,022  $\mu\text{S}/\text{cm}$  (A-OB4), with bores adjacent the Dawson River recording lower EC compared to bores further away. Groundwater pH within the alluvial bores was generally slightly acidic to neutral, pH values recorded were between pH 6.08 to pH 7.00.

### 7.7.3 Stygofauna presence

Stygofauna were recorded at four of the 12 sites sampled. A total of three taxa and 24 individuals were collected throughout the five surveys. Stygofauna recorded included:

- Phreatobites from the family Naididae (aquatic worms) were recorded at three sites A-OB1, A-OB2 and A-OB3; and
- Stygophiles from the Family Haplodesmidae (centipedes) and Campodeidae (primitive insects) were recorded at three sites A-OB1, A-OB2 and A-OB8.

The Stygophiles collected in the samples were determined to be coincidental (i.e. falling into the bore, occupying the vegetation adjacent to the bore, living within the bore above the water table) and are therefore not considered further.



All the stygofauna associated with the alluvium were collected from the unconfined alluvial aquifers of the Dawson River alluvium associated with the river channel; the diversity of stygofauna from these locations is low. There was no groundwater dependent fauna present in bores on the floodplains of the Project area.

None of the recorded species of stygofauna are listed as threatened under either the state or Commonwealth legislation.

The ecological value associated with the stygofauna in the study area is considered to be low due to the restricted nature of the habitat and the low number of disturbance tolerant taxa. The alluvial aquifer geology consists of the fine-grained sands and clays which limit or prohibit the occurrence of stygofauna (Appendix C, Flood Impact Assessment).

Further details regarding the stygofauna assessment undertaken for the Project are provided in Appendix I, Stygofauna Assessment.

## 7.8 Potential impacts to flora and fauna values

This section describes potential impacts resulting from the Project in relation to flora and fauna values. The impact assessment includes consideration of impacts associated with all aspects of the construction and operation of the Project, including:

- open cut mining and associated infrastructure within MLA 700057;
- construction and operation of water extraction/release infrastructure;
- construction of the Moura-Baralaba road realignment; and
- construction of electricity infrastructure to supply power to the mine.

As the final ETL alignment has not yet been determined, this impact assessment assumes a worst-case scenario by considering potential impacts of each alignment using a clearing width of 20 m.

The impact assessment considers direct, indirect, cumulative and facilitated impacts associated with the Project; the structure of this assessment groups potential impacts to terrestrial, aquatic, groundwater dependent and stygofauna ecological values under each of these impact types. The following potential impacts from the Project were identified and considered as part of this assessment:

- direct impacts from vegetation/habitat clearing;
- indirect impacts such as changes to groundwater, surface water flow, including changes to flood levels and duration of inundation, noise and vibration, artificial lighting, dust, erosion and sedimentation, and the introduction or spread of invasive species;
- facilitated impacts (no facilitated impacts area expected from the Project); and
- cumulative impacts, considering direct and indirect impacts associated with nearby developments.

Measures to mitigate and manage impacts are described in section 7.9.

### 7.8.1 Direct impacts

The Project will commence with site clearance works to prepare for constructing necessary infrastructure, including the ETL, access roads, dams, product and ROM stockpile areas, haul road, the CHPP and MIA. Site clearance involves vegetation clearing, soil removal and storage, earthworks and drainage works.

### 7.8.1.1 Land clearance

Vegetation and habitats will be progressively cleared for the Project.

The distribution of remnant and regrowth vegetation communities for the Project is shown in Figure 7.7. Remnant and regrowth of concern and least concern communities under the VM Act will be impacted in the Project site and water release/extraction infrastructure area. The ETL is anticipated to require the removal of endangered regrowth vegetation.

Vegetation clearing will cause a direct impact by removing vegetation that also provides suitable habitat for a range of flora and fauna species. Fauna habitat resources for foraging, sheltering and breeding within the disturbance footprint that may be impacted by the Project include the following:

- understorey and groundcover – shelter and forage habitat for amphibians, reptiles, small birds and ground-dwelling mammals;
- fallen logs, coarse woody debris and leaf litter – shelter habitat for amphibians, reptiles and ground-dwelling mammals;
- hollow-bearing trees and stags – shelter and breeding habitat for reptiles, birds and arboreal mammals and micro-bats;
- food trees, shrubs, grass and herbs – forage resources for small birds, Koalas and other herbivorous mammals;
- nectar producing trees and shrubs – foraging habitat for insects, blossom-dependent birds, arboreal mammals and megachiropteran bats (i.e. Flying-foxes); and
- gilgai and constructed dams – water resources and aquatic habitat for a range of amphibians, mammals, birds and reptiles.

Approximately 10.1 ha of remnant vegetation and up to 5.5 ha of high-value regrowth vegetation will potentially be cleared or disturbed for the Project, some of which provides suitable habitat for threatened species. A summary of the areas of each remnant vegetation community that will be impacted in the Project area is in Table 7.14.

Impacts within the ETL study area have been estimated based on a maximum impact scenario using the two alignment options presented in Figure 7.7. There is potential for this maximum area of impact to be reduced during the detailed design of the ETL.

Additional areas of non-remnant vegetation, which are TECs (they are not high-value regrowth) and that provides suitable habitat for threatened species will also require clearing. These areas have been estimated in the habitat mapping and impact assessments (section 7.10).

No direct clearing of field validated GDE areas will occur for the Project.

Table 7.14: Summary of remnant and high-value regrowth vegetation impacts

Vegetation community	Conservation status <sup>1</sup>		Total remnant (high-value regrowth) area within study area (ha)	Total remnant (regrowth) area to be impacted (ha)		
	VM Act	Biodiversity		Project site and water release/extraction infrastructure area	ETL study area	Total impact
RE 11.3.3/a	OC	OC	362.0 (117.6)	0.0 (0.1)	0.0 (0.0)	0.0 (0.1)
RE 11.3.25	LC	OC	287.1 (0.0)	0.4* (0.0)	0.0 (0.0)	0.4* (0.0)
RE 11.4.9a	E	E	0.0 (7.6)	0.0 (0.0)	0.0 (0.4)	0.0 (0.4)
RE 11.5.9	LC	NCP	8.7 (5.3)	8.7 (4.6)	0.0 (0.0)	8.7 (4.6)
RE 11.5.15	LC	E	1.1 (0.0)	1.1 (0.0)	0.0 (0.0)	1.1 (0.0)
<b>Total</b>						<b>10.2 (5.1)</b>

\* No clearing of canopy trees is proposed to install the water release/extraction infrastructure outside MLA 700057. Impacts will be limited to the ground and shrub layers.

<sup>1</sup> E = Endangered, OC = of concern, LC = Least concern, NCP = No concern at present

### 7.8.1.2 Aquatic habitat

Removing and modifying aquatic habitat in the disturbance area comprising ephemeral watercourses, drainage lines and wetlands will occur due to the Project's activities, including:

- The unnamed waterways and the mapped lacustrine (farm dams) and palustrine wetlands (ephemeral wetlands) of GES within the disturbance area will be partially or completely lost.
- There will be a small area of disturbance on the banks of the Dawson River to construct the proposed water release and extraction infrastructure.
- The mapped waterways crossed by the proposed Moura-Baralaba Road realignment will be modified, but ground-truthing indicates a lack of waterway features in some instances, and the scale of this disturbance is minor in nature and can be mitigated.
- No direct impacts to waterways are likely because of the ETL due to a lack of waterway characteristics in the ETL assessment zone and the ETL can be constructed to avoid direct impacts to mapped features.

Within the disturbance area, waterways have low aquatic ecosystem value and wetlands provide moderate aquatic ecosystem value. Most of the mapped waterways do not meet the definition of a waterway providing for fish passage (as defined under the Fisheries Act), with no bed and banks present i.e. the waterway channel was indistinguishable from the surrounding paddocks. Nevertheless, it is estimated 0.88 ha of ground-truthed waterways providing fish passage will be permanently removed within the disturbance area. Additionally, a further 1.45 ha of waterways providing fish passage will be removed upstream of the disturbance area due to a loss of connectivity to downstream waterways impacted by the Project. This equates to a total impact of 2.33 ha of waterways providing fish passage.

The estimated total area of wetlands to be lost is 2.69 ha. While the lacustrine wetlands provide some habitat when wet and supports aquatic communities, there is poor connectivity between wetland features to enable aquatic flora and fauna to establish and maintain self-sustaining communities.



The aquatic habitats of the waterways and wetlands are common and typical of the region, and while their removal will mean a loss of available aquatic habitat for aquatic communities, this is not expected to impact aquatic ecology at a regional scale.

The Project has been designed to avoid impacts to the HES wetland and the associated WPA trigger area. At its closest point, the northern waste rock emplacement is set back from the mapped HES wetland vegetation by more than a 1 km. There is no mapped wetland vegetation or WPA trigger area within the extent of potential disturbance.

No threatened aquatic species or habitat has been identified in the Project area. All species identified in the Project area are considered common with a broad distribution in the region, removal of habitat for these species will not have a significant impact at a regional scale. Potential habitat for threatened aquatic species has been identified in the major waterways surrounding the Project area (section 7.5); however, the Project is not expected to impact potential habitat.

Constructing the water extraction/release infrastructure will result in disturbing a small area of riparian vegetation and streambank habitat (less than 1,000 m<sup>2</sup> total); however, no canopy trees are proposed to be removed.

The proposed Moura-Baralaba Road realignment will intersect a number of ephemeral waterways. The crossings will require removing aquatic habitat and riparian vegetation from the banks of the waterways around the footprint of the road crossings that has the potential to be barriers to fish passage. These waterways are considered to have low aquatic ecological and fish passage values and the road realignment development footprint is expected to be small. The design of waterway crossings (culverts) will consider fish passage and water flow, and they will be designed in accordance with the 'Accepted development requirements for operational work that is constructing or raising waterway barrier works' (DAF, 2018). As such, no significant impacts are expected.

The ETL and associated infrastructure will have minimal ground disturbance and the transmission line poles will not be located in waterways. The infrastructure will not impact overland flows or flooding. It is not envisaged that any waterway crossings (e.g. for access tracks) will be required. As such, no direct impacts to waterways are expected because of the ETL.

Potential impacts to wetlands (MSES), threatened aquatic species (MNES and MSES) and fish passage are discussed in section 7.10.

## **7.8.2 Indirect impacts**

### **7.8.2.1 Changes to hydrology**

The Project is not expected to change flood depth in flood events up to and including the 10% AEP, as the Project footprint is not in the 10% AEP existing case flood extent. The maximum catchment area captured by site storages over the Project life is approximately 966 ha (9.66 km<sup>2</sup>), which accounts for approximately 0.024% of contributing catchment at the Dawson River at Beckers gauging station (40,500 km<sup>2</sup>) (Appendix A, Surface Water Impacts Assessment).

The revised 2.5 Mtpa plan is located above the 0.1% AEP flood plain and does not require an operational flood levee. The Project will not reduce the catchment area reporting to the wetland or a significant impact on flooding interactions between the wetland and the Dawson River and Banana Creek.

Predicted changes are considered minor and unlikely to have a measurable impact on flora and fauna values beyond the Project area. Hydrology is discussed in further detail in Chapter 4, Surface Water and Chapter 6, Flooding and Regulated Dams.

No significant catchment modifications (e.g. diversion of watercourses) are required for the Project. Changes in hydrology are restricted to:

- altered timing and magnitude of flows in the receiving environment due to release of clean and mine-affected waters;
- altered timing and magnitude of flow in the receiving environment due to baseflow leakage from the Dawson River; and

### *Surface water flows*

Potential impacts to the catchment have been assessed and the results presented in Appendix A, Surface Water Impact Assessment. The Project is expected to result in a total reduction of 0.024% in catchment area contributing to the Dawson River at Beckers gauging station and 0.007% of the Fitzroy River at Riverslea. The Project is expected to reduce streamflow by less than 0.045% (mean annual flow), which is not expected to impact the existing Dawson River riparian vegetation or channel morphology. It is therefore concluded that catchment excised by the Project will have a negligible impact on streamflow in the Dawson River (Appendix A, Surface Water Impact Assessment).

The loss of catchment area is expected to result in a moderate reduction in flows for the minor waterways that will remain within and immediately downstream of the Project area (Appendix A, Surface Water Impact Assessment). The downstream reach of the north-western waterway (Shirley's Gully) is of moderate aquatic ecological value and will experience a reduction in flow from the loss of upstream catchment. This will result in an overall minor (localised) impact to the aquatic ecosystem, noting that conditions in the reaches upstream of the Neville Hewitt Weir pool are not expected to be significantly different than those that occur in many of the ephemeral waterways of the region, with this habitat still available to aquatic flora and fauna during times of flow. The lower reaches of the gully are within the Neville Hewitt Weir pool and provide refuge habitat for aquatic flora and fauna; this will not change as a result of the loss of catchment area as water backs up in the pool from the Dawson River.

The Project will not reduce the catchment area reporting to the wetland and not have a significant impact on flooding interactions between the wetland and the Dawson River and Banana Creek (Appendix A, Surface Water Impact Assessment).

### *Baseflow leakage*

Drawdown effects on the baseflow/leakage of watercourses and drainage features near the Project have been assessed by Watershed (2023) (Appendix B, Groundwater Modelling and Assessment) and discussed in Chapter 5, Groundwater. Minor incidental transfer from the Dawson River (upstream from Neville Hewitt Weir) to the surficial geology is predicted to be up to approximately 0.2 ML/day, although more likely 0.16 ML/d. When compared to the average surface water flows in the Dawson River for the past five years, the water movement represents less than 0.01% reduction in flow.

Similarly, the modelled leakage predicted from Banana Creek is considered negligible, as it only flows on occasions following rainfall events (Appendix B, Groundwater Modelling and Assessment).

Therefore, mining effects on groundwater are considered unlikely to result in impacts to riparian vegetation or wetlands along the Dawson River and Banana Creek.

### *Water releases*

Mine water is proposed to be released to prevent mine water accumulating on-site and to reduce the risk of uncontrolled mine water releases to natural waterways.

Mine water releases have been modelled to occur from the Mine Water Dam located south-east of the mine infrastructure area. Mine water will be released through a pumped transfer at a maximum rate of 500 L/s, around the northern extent of the MLA area directly to the Dawson River channel. Releases of mine affected waters are not expected to influence streamflow volume or duration in the Dawson River, resulting in a negligible impact to local hydrology. The proposed strategy is to release into the Dawson River, with all controlled releases made in accordance with the approach outlined in condition F11 of the Model Mining

Conditions (DES, 2017) which is based on 'Model Water Conditions for Coal Mines in the Fitzroy Basin' (DES, 2013).

Accordingly, all release events will coincide with medium-high streamflow conditions in the Dawson River and will occur for a duration consistent with natural flows (Appendix A, Surface Water Impact Assessment). No changes to the duration of natural medium-high flows in the Dawson River are predicted (Appendix A, Surface Water Impact Assessment). Further, no significant changes in water quality are predicted to result.

There may be localised impacts to aquatic flora and fauna in the mixing zone during controlled water releases from the high electrical conductivity, however, any such impacts would be intermittent short-term and reversible, as aquatic flora and fauna would recolonise the area once releases cease. No impacts to aquatic flora and fauna beyond the mixing zone are expected.

Modelling for the unlikely occurrence of uncontrolled releases indicates they are unlikely to result in a significant impact. Potential uncontrolled releases, if required, would only occur during high-flow events in the Dawson River and would be of minimal volume and short duration when compared to the volume and duration of flow in the receiving waterway, and they would have low to moderate EC (Appendix A, Surface Water Impact Assessment). Overtopping flows from sediment dams are not expected to impact on water quality affecting vegetation in the overflow pathways between the Project MLA and the Dawson River. Water from any uncontrolled release would flow towards the Dawson River and Banana Creek, and would not flow towards, or into, the HES wetland (Appendix A, Surface Water Impact Assessment).

### *Changes to flood regimes*

Engeny Water Management developed a hydrologic model of the Dawson River catchment to assess the current flood risk and the potential impacts of the Project on flooding. Details of the model development are provided in Appendix C, Flood Impact Assessment and summarised in Chapter 6, Flooding and Regulated Dams.

The baseline flood mapping (the existing case) for peak flood depth, velocity, and flood inundation duration for 10% to 1% AEP flood events for the existing case is provided in Appendix C, Flood Impact Assessment.

The Dawson River experiences significant seasonal variations in high flows with flooding typically occurring during the wet season, between October and April. The baseline flood modelling for the Dawson River, associated tributaries and floodplains indicates that:

- Flood flows begin to break out of the Dawson River and Banana Creek channel in events greater than the 10% AEP and flow across the eastern floodplain at the Project site. The Project MLA area is partially inundated in the 2% AEP flood event but is not inundated in the 10% AEP flood event.
- The Dawson River floodplain has a flow width of approximately 5.5 km in flood events greater than 2% AEP adjacent to the Project.
- The flood extent in the 1% AEP event inundates approximately 50% of the Project MLA area however, inundates less than 16% of the proposed Project disturbance area.
- Flooding of the Dawson River at the Baralaba township is largely confined to the main river channel although minor flooding of the local school and properties boarding the river channel results in the 1% AEP flood event.
- Peak flow velocities in the 1% AEP flood event within the Dawson River channel adjacent to the Project are generally between 1.0 m/s and 3.0 m/s and peak flood velocities on the floodplain areas are generally below 1.0 m/s.
- Properties located on the Dawson River floodplain near the Project site are inundated for more than 250 hours in the 1% AEP flood event. It is noted the duration of inundation is heavily dependent on the storm duration.
- Peak flood wave travel time between the Bindaree (130374A) and Beckers (130322A) gauging stations is approximately 22 hours in the 10% AEP flood event and 18 hours in the 1% flood event.



The flood modelling for the Project (Appendix C, Flood Impact Assessment) has demonstrated that:

- The Project will cause a small (less than 10 mm) reduction in peak flood levels in the Dawson River channel and on the eastern floodplain downstream of the Project MLA in a 1% AEP flood event due to the Project directing slightly more flood waters in larger flood events to the western floodplain and anabranch.
- There are no flood depth impacts from 20% and 10% AEP flood events (refer to Figure 6.7 in Chapter 6, Flooding and Regulated Dams).
- An increase of 200 mm is predicted for the 2% AEP and 1% AEP flood events that will primarily be limited to the area between the Project site and the Dawson River and an increase of 20 mm is predicted on the floodplains to the west of the Project site.
- An increase of 10 mm to 20 mm is predicted in the Dawson River channel beyond the Project site for the 2% AEP and 1% AEP flood events.
- There will be slightly reduced peak water levels in the main Dawson River channel and on the eastern floodplain downstream of the Project site during events rarer than the 10% AEP (e.g. 2% AEP and 1% AEP flood events) because flood waters will be directed to the western floodplain and anabranch.
- There is no change in flow velocities greater than 0.1 m/s predicted up to, and including the 10% AEP flood event, and these changes in flow will be experienced mostly in the channel.
- The changes in flow velocity up to and including the 1% AEP event are predicted to be within 0.1 m/s to 0.3 m/s adjacent to the northern out-of-pit WRE and will be contained within the MLA boundary. There are negligible changes to peak flood velocity outside of the Projects MLA boundary.
- The inundation duration will be unchanged for flood events up to and including the 1% AEP.
- Flooding of the MSES wetland in the south-western corner of the Project site is expected to have a negligible impact to the wetland condition. It is expected to:
  - occur in AEP flood events greater than 10%;
  - have no change in flooding conditions in the 2% AEP;
  - have only 0.02 m increase for the 1% AEP flood event; and
  - have very limited impact on peak flow velocity, is likely to generally remain unchanged.

It is considered unlikely that the ecology of the Dawson River floodplain will be significantly impacted by changes in the flow regime (Appendix F, Terrestrial Ecology Assessment). This is because modelled changes are unlikely to result in major shifts in the structure and composition of riparian and floodplain vegetation communities. Such changes in vegetation would be more likely to occur from significant and sustained or permanent alterations to the flood regime, which are not predicted. Similarly, the brief and minor changes to depth and velocity during flood events that overtop the Dawson River and Banana Creek banks that have been modelled for the Project are unlikely to significantly increase levels of erosion and sedimentation of the floodplain. Mechanical damage to plants during higher flows is unlikely to occur as a result of the Project (Appendix F, Terrestrial Ecology Assessment).

The HES wetland is not inundated by the 20% and 10% AEP floods. In the mine developed case 2% AEP flood, there is no predicted change to the peak flood depth or the peak flood velocity (Appendix C, Flood Impact Assessment). In the 1% AEP flood, the HES wetland will experience: a very slight increase to peak flood water depth of 0.02 m; no increase in peak flood velocity; and no change to the inundation duration (Appendix C, Flood Impact Assessment). The periods of inundation experienced by the wetland would still be considered infrequent, so the habitat provided by the wetland (i.e. ephemeral aquatic habitat) will remain unchanged. The wetland does not currently provide habitat for the threatened turtle species because of infrequent inundation, and this will continue to be the case (Appendix G, Aquatic Ecology Assessment).

Increases in flood duration and depth across the Dawson River floodplain are expected to be of an inconsequential magnitude in terms of impacts on recharge to the shallow alluvial aquifers that are responsible for sustaining GDEs (Appendix H, Groundwater Dependent Ecosystem Assessment). It is highly unlikely that changes to flood behaviour will be detrimental to the health of GDEs occurring on either the Dawson River or

Banana Creek, or their associated floodplain that coincides with areas where negligible change to flood behaviour is predicted (Appendix H, Groundwater Dependent Ecosystem Assessment).

### *Surface water quality*

Potential water quality contaminant sources associated with the Project include:

- surface runoff from disturbed areas;
- surface runoff from mine waste or stockpiles;
- process waste streams and entrained water;
- seepage, overtopping or dam failure of site water storages;
- seepage from waste rock emplacements; and
- groundwater ingress to the open cut pit.

During mining operations, potential influences on water quality will include increased sedimentation and turbidity, concentrations of contaminants (namely metals and hydrocarbons) and saline and acid drainage. The site water management system has been designed to divert all clean water around operations and capture all contaminated water into sediment dams and mine affected water dams. The potential for impacts on aquatic environmental values due to changes in water quality is low.

Seepage generated in the out-of-pit and in-waste rock emplacements is expected to be of low salinity and neutral to alkaline pH (Appendix E, Geochemical Assessment), so is not expected to influence water quality in the receiving environment or impact the aquatic ecosystem. The geochemical assessment of potential spoil and coal reject materials indicates spoil to be low risk and Non-Acid Forming (NAF). Potential coal reject material was also found to be low risk and mostly classified as NAF, although it was partially classified as Potentially Acid Forming with a 'low' to 'moderate' capacity to generate significant acidity (Appendix A, Surface Water Impact Assessment). As a result, terrestrial or aquatic ecosystems are not expected to be impacted by surface water runoff, process waste streams or seepage.

Water quality is discussed in greater detail in Chapter 4, Surface Water.

### *Water demand and supply*

The Project will source most of its water from surface water runoff and groundwater ingress into the mining pit. However, during very dry years (less than 5% of years for the majority of the Project life), water will be sourced from the Dawson River under existing water entitlements, via the water extraction infrastructure (Appendix A, Surface Water Impact Assessment). This is particularly the case during Years 2 to 6, when dust suppression demands are the highest and groundwater inflows are at their lowest. The maximum annual demand on Dawson River water licences is expected to be 881 ML in the 5th percentile during year 3 of the Project (Appendix A, Surface Water Impact Assessment).

This has the potential to impact on the aquatic ecology downstream from the off-take point, however, the severity and extent of impact would be influenced by the river water levels and flows at the time of extraction. As the water offtake is from the impounded reaches of the river, the main impact of water extraction will be reduced water levels in the river (rather than a change in habitat diversity). The impact of reduced water levels would be a loss of aquatic plants and associated macroinvertebrates at the water's edge. Mobile species (fish and turtles) would still have refuge habitat to move into in the centre of the river channel, and as such, impacts to these species because of water extraction are not expected.

### 7.8.2.2 Groundwater drawdown and water quality

#### *Groundwater drawdown*

Drawdown will interact with the saline basal colluvial groundwater system with depressurisation and drainage of the system toward the mining void. There may also be some increased leakage from Banana Creek to the underlying sediments, which Watershed HydroGeo (2023) considers negligible due to a conservative model stimulation based on a fixed head / consistent source of water, noting that Banana Creek flows only irregularly, as discussed in the flood modelling report (Engeny, 2023).

Groundwater drawdown will only be propagated beneath Banana Creek during periods when the alluvium (or colluvium, as it is mapped by the Qld government geology mapping) is saturated and would only induce leakage of surface flow from this watercourse when the watercourse is flowing, and a saturated connection exists between the alluvial groundwater table and surface water in the creek. In this instance, the impact of drawdown and the induced leakage would likely be negligible in comparison to the rate of groundwater recharge. There will be no interaction between the perched discontinuous sandy lenses which seasonally support vegetation groundwater dependence and the drawdown in the deeper colluvial groundwater unit due to the physical separation of these units, and the lack of hydraulic connection. Because of these factors, there are no identified causal pathways for impact which have capacity to alter GDE function and cause ecological harm.

With implementation of management and monitoring controls, it is considered that the risk to GDE's posed by mine development is insignificant.

The Project is not predicted to significantly impact stygofauna because the alluvium is largely being unsaturated within the pit extent and there is limited groundwater level drawdown predicted in the shallow groundwater systems. Groundwater level drawdown is largely contained within the Permian coal measures, wherein no stygofauna had been recorded during either the 2012 or 2017–2019 sampling programs. Additionally, the Dawson River alluvium extends along the Dawson River and lower reaches of the creeks at the confluence with the Dawson River. Therefore, potential habitat for stygofauna is more extensive than the alluvium in the area of influence associated with the Project. Impacts are considered insignificant in the regional context of the Dawson River alluvium (Appendix B, Groundwater Modelling and Assessment).

#### *Groundwater quality*

There is not expected to be any measurable change in the quality of groundwater as a consequence of mining, either in Permo-Triassic strata (within which groundwater level drawdown would be largely contained) or in younger units, such as alluvium or colluvium. The localised hydraulic sink that will form as mining develops will minimise the potential migration of saline or poorer quality groundwater from the open cut pit to other areas. Consequently, there will be negligible impact on groundwater quality in aquifers or surface water quality in downstream waters due to groundwater interaction (Appendix B, Groundwater Modelling and Assessment).

The disconnected sandy lenses supporting GDEs on a seasonal basis are underlain by partially confined groundwater systems associated with the regional alluvial aquifer and the Permian sediments / coal measures. The potential for saline water from these groundwater units to contaminate any fresh perched groundwater system is negligible as there is no risk of upward saline groundwater propagation under hydrostatic pressure (Appendix B, Groundwater Modelling and Assessment).

Rock spoil is expected to be NAF and have a negligible risk of developing acidic conditions (Appendix E, Geochemical, Assessment). The spoil is also expected to generate low salinity rainfall runoff and seepage that will be captured by sediment dams. Uncontrolled release of seepage is not expected to occur from site, and recovered seepage flows will be managed in accordance with the mine water management system. Seepage from waste rock emplacements is not expected to cause any additional impacts to water quality in the receiving waterway (Appendix A, Surface Water Impact Assessment).

Based on the low salinity of runoff and seepage, and the management of mine affected water storages and sediment dams under the mine water management system, it is considered that there is low risk of impact to



the water quality of, or the introduction of contaminants to, the alluvial aquifers that support GDEs. As a result, terrestrial and aquatic ecosystems and GDEs are not expected to be impacted from any release of seepage.

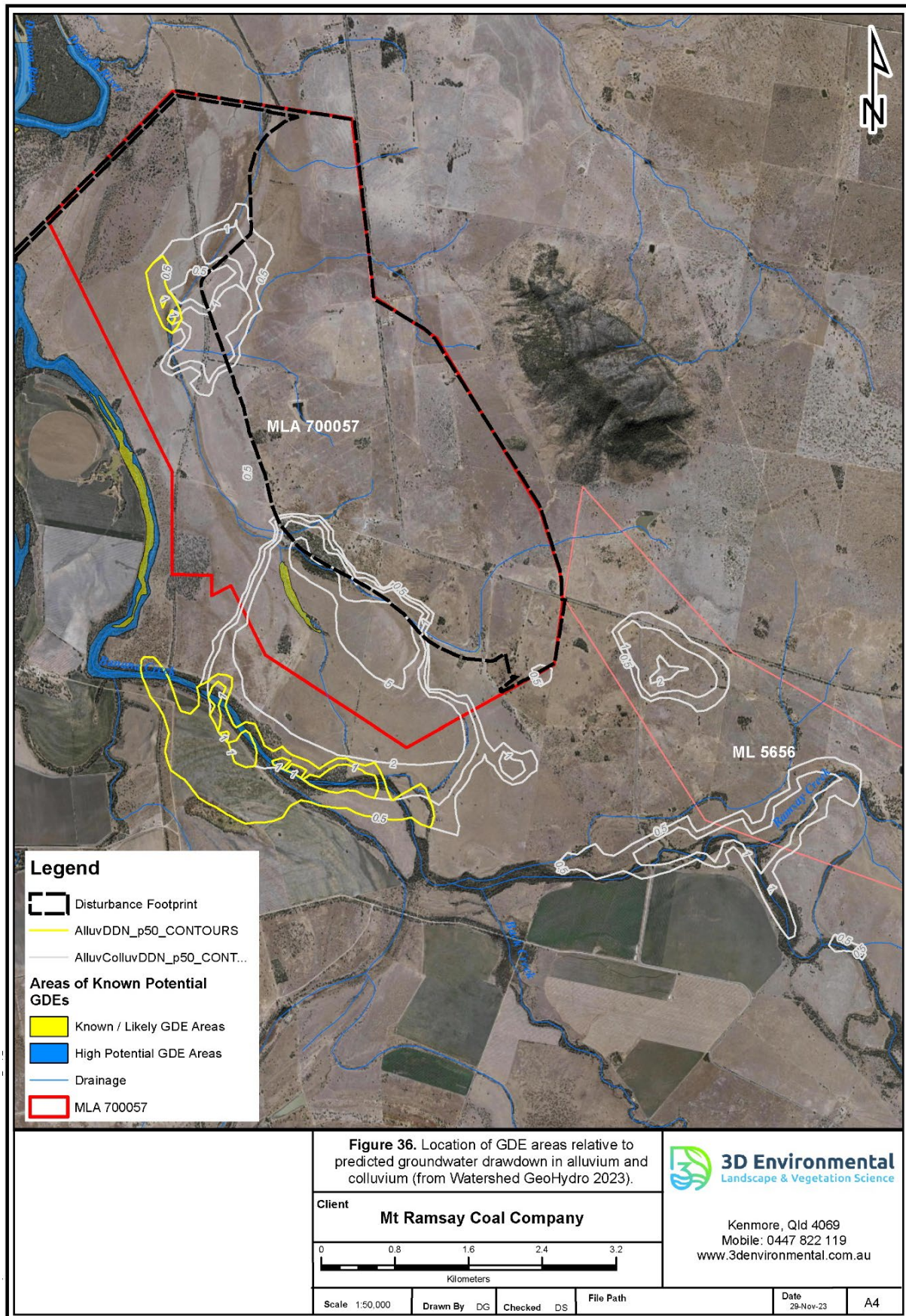


Figure 7.33: Location of known and high potential GDE areas relative to predicted groundwater drawdown

### 7.8.2.3 Habitat fragmentation and edge effects

Vegetation clearing can result in fragmentation of habitat that can impact flora and fauna species. Clearing for the Project is unlikely to significantly fragment habitat due to the highly disturbed and largely cleared landscape in which the Project is located. However, there is potential for the Project to create minor local barriers or impair movement of some fauna species, between Mount Ramsay and the Dawson River and Banana Creek. However, the almost entirely cleared area between Mount Ramsay and the Dawson River and Banana Creek already restricts faunal movements between these landscape features to species of high mobility (such as birds) and species tolerant of cleared disturbed areas.

The Project area is characterised by highly fragmented patches of remnant, regrowth and non-remnant vegetation that have been isolated by historic broad-scale land clearing in the region. Contiguous intact vegetation is largely confined to the Dawson River and Banana Creek riparian corridor. The Project area does not provide corridor habitat for fauna movement. There is potential for the Project to create some minor local barriers or further impair movement between Mount Ramsay and the Dawson River and Banana Creek, supporting only fauna species able to inhabit or move through the non-remnant, disturbed land.

A further consequence of clearing vegetation is that it can produce “edge effects”. Edge effects are impacts that can occur at the interface between natural habitats and cleared areas or developed land. Edge effects may cause modifications to the local environment in terms of altered species and structural composition due to increased light, wind shear, and weed invasion.

Clearing for the Project will primarily occur across the Project site. However, historic clearing and thinning has been undertaken throughout the Project area and surrounding areas already, leaving no areas that are not already subject to edge effects. Given the open structure of the woodland habitat that remains in the Project area, edge effects to remaining patches are not likely to be significant.

In accordance with the DES’s SRI Guideline, the Landscape Fragmentation and Connectivity (LFC) Tool was used to assist in identifying and quantifying the Project’s potential impact on habitat connectivity. The LFC Tool determined that the Project would result in a significant residual impact on local connectivity, whereby the analysis showed a significant impact in reducing core remnant areas at the local scale.

### 7.8.2.4 Vehicle strike

The movement of haul trucks on haul roads within the Project area has the potential to result in injury or mortality of fauna. Ground-dwelling fauna are most susceptible to this impact, although birds and micro-bats may also be impacted.

The mining operations will operate 24 hours per day, 7 days per week. All trafficable areas will be subject to enforced speed limits reducing the risk of animal strikes. Relevant signage, safe driving procedures and staff inductions addressing this risk will increase awareness and contribute to reducing the risk of this impact.

The vibration of approaching haul trucks may also provide animals with warning and prompt fauna to move away from the path of approaching vehicles.

### 7.8.2.5 Artificial lighting

Potential impacts of light spill from lighting associated with the Project is likely to be limited and restricted to infrastructure areas around the MIA, ROM and CHPP. Fauna species identified in the Project area are adaptable and likely to persist in areas close to infrastructure (i.e. generally able to adapt to environmental conditions over small areas). Most fauna species would habituate to the levels of artificial light or temporarily move away from areas of night lighting. The extent of impact will vary between species and habitat types as light shed will be greater in more open habitat types. The common and adaptable species identified in the study area that are more likely to persist in areas close to infrastructure areas. Lighting is not likely to significantly impact fauna.



#### 7.8.2.6 Noise and vibration

Noise and vibration associated constructing and operating the mine has the potential to disrupt the routine activities of fauna species. Ongoing noise and vibration emissions associated with the Project will be generated from various sources, such as mining equipment and blasting activities.

Most fauna species exhibit a high degree of adaptability to the noise and vibration from machinery and blasting. Noise or vibration from mining activities may cause some birds to modify their behaviour, potentially altering feeding activity or abandon nests during breeding season. It is noted that sudden loud noises may also startle bird and mammal species. Depending on the magnitude of construction and mining noise, there may be some species that will be affected by noise and, therefore, will forego utilisation of habitat within the noise disturbance zones. However, animals are likely to adapt to the disturbance and/or move to similar habitats in the surrounding landscape.

Further details on noise and vibration, including mitigation measures, are discussed in Chapter 10, Noise and Vibration.

#### 7.8.2.7 Dust

Construction and mining activities can generate dust, which has the potential to impact vegetation and fauna. However, recent studies on the impacts of dust from unsealed roads, including haul roads, on vegetation and fauna, have found no evidence that dust has any detrimental impacts on vegetation or fauna abundance (Cumberland Ecology, 2015; Jones *et al.*, 2016).

Trinity (Appendix L, Air Quality and Greenhouse Gas Assessment) investigated potential impacts of dust deposition on remnant vegetation in close proximity to the MLA. It was found that impacts due to dust deposition on the vegetation are likely to be indiscernible compared with changes due to temperature and water availability (Appendix L, Air Quality and Greenhouse Gas Assessment).

Much of the remnant vegetation surrounding MLA 700057 would be subject to dust deposition rates equal to, or only marginally above background levels, and as a result, there is no anticipated detrimental effect on their functioning from operating the Project (Appendix L, Air Quality and Greenhouse Gas Assessment).

In general, dust has the potential to impact fauna if it also introduces toxic compounds such as heavy metals into soil and animal tissue. The geochemical assessment (refer Appendix E) indicates that bulk overburden and interburden (spoil) materials – and potential coal reject materials – have low levels of metal and metalloid enrichment, which is consistent with Permian-age coal measures throughout eastern Australia, and consistent with the Rangal Coal Measures in the Bowen Basin. Thus, there is no substantial risk of such contamination occurring in the areas surrounding the Project. Overall, the potential impacts of dust from the Project onto fauna are likely to be insubstantial.

As described in section 7.9, standard dust minimisation and suppression strategies, such as watering haul roads will be implemented for the Project to minimise dust generation. Mined areas, particularly waste rock emplacements, will also be progressively rehabilitated and vegetated following mining, reducing the potential for dust generation. Dust is considered unlikely to cause a significant impact on the ecological values of the areas surrounding the Project.

Further details on air quality modelling, including mitigation measures, are discussed in Chapter 9, Air Quality.

#### 7.8.2.8 Erosion and sedimentation

The Project has the potential to result in erosion of disturbed areas and sedimentation of waterways downstream from clearing vegetation to develop open cut pits, and constructing haul roads and other infrastructure. Vegetation clearance protocols and erosion and sediment control measures will be implemented to minimise potential impacts as described in section 0.



### 7.8.2.9 Introduced species

Given the existing extent of disturbance and presence of weeds in the Project area (section 7.4.5), the proposed Project is unlikely to increase terrestrial weed populations. Similarly, as all Project activities will occur in the same catchment, the Project is unlikely to result in new invasive aquatic flora species being introduced.

Feral animals already occur and are able to move freely throughout the landscape and/or readily colonise new areas (section 7.4.5). The Project is unlikely to introduce new terrestrial pest animals to the area. The clearing of vegetation may temporarily attract some predatory native and feral animals; however, any impact will be managed accordingly by implementing a Weed and Pest Management Plan (section 0 ).

Two species of invasive aquatic plants (Water Lettuce and Olive Hymenachne) were recorded in the Dawson River and Anabranche, and they are also known to occur in the wider Dawson River sub-basin. Two species of invasive fish (Eastern Mosquitofish and Goldfish) were recorded as part of the field surveys and are known from the wider Dawson River sub-basin.

Water supply 'make-up' will be sourced from water allocations from the Dawson River via a licensed agreement; related entities of the Proponent currently hold over 1,418 ML of water from the Fitzroy Basin, Dawson River Zone C/D and 315 ML of water from the Broadmeadow properties. Given additional water supply make-up is being sourced from the Dawson River adjacent to the Project, it is unlikely that new species will be introduced as a result of any water supply pipelines associated with the Project. Changes to water quality resulting from the Project may promote conditions that encourage the proliferation of invasive fish and aquatic plants, which can thrive in poor water quality (e.g. high nutrient waters). However, where impacts to water quality are appropriately managed (as is proposed), this outcome is not predicted.

There is potential that aquatic weeds may enter and establish in the HES wetland when it is inundated by flood waters from the Dawson River, however, the risk of this occurring is not increased compared with the current scenario, as the frequency of flooding in the wetland will not change. In addition, works in and around wetlands and waterways outside of the Project area where invasive plant species occur have the potential to spread aquatic weeds if vehicle and other plant and equipment are not appropriately washed down.

### 7.8.3 Facilitated impacts

Facilitated impacts relate to impacts from other Projects (including by third parties) which are made possible (facilitated) by the Project being assessed (this Project). Facilitated impacts may be expected to occur through the development of an infrastructure Project (e.g. a dam, road or rail line), where that development would enable the development of other Projects which otherwise may not have been viable (e.g. the development of a road leads to urban development in an undeveloped area).

The Project and mining operations will not facilitate the development of other Projects. Although the Project will include realigning the Moura-Baralaba Road, this road already exists, and the realignment will not enable other Projects.

The ETL will link the Project to the Baralaba Substation, approximately 6 km east of Baralaba. Constructing the ETL for the Project area will not facilitate any future Projects connecting to the electricity network. The ETL does not link any undeveloped areas (apart from the Project area) to the electricity network and the establishment of such a short length is not considered to be an economic impediment to any other Projects that were to occur in the region.

Similarly, the water extraction/release infrastructure traverses directly to the Dawson River from the Project. It does not allow for other potential Projects to utilise this infrastructure for the extraction/release water from/to the Dawson River. As with the ETL, installing future Projects in the region is not considered an economic impediment to their development.

It is expected that where possible, the post-mining Project area will be reinstated to grazing lands of a similar land suitability to that existing prior to mining; or, where this cannot be achieved, it will be used for an alternative use that provides long-term ecological value to the region. It is not considered that an agricultural

use or alternative use that provides similar value will facilitate the development of Project that could cause additional (facilitated) impacts to those identified for the Project.

As such, there is not expected to be any facilitated impacts from the Project on any flora or fauna values.

#### 7.8.4 Cumulative impacts

The Brigalow Belt Bioregion has a long history of land clearing and landform modification associated with agricultural pursuits, forestry, mining, gas production and township development. The construction of the roads, rail lines and pipeline easements required to facilitate development of the region has further reduced and fragmented the extent of remnant vegetation persisting in the present landscape. The current extent of remnant vegetation in the bioregion has been estimated by the Queensland Herbarium to be 15,038,111 ha or 41.2% of the pre-clearing cover (Accad *et al.*, 2019). This is higher than the estimated extent of remnant vegetation in the Dawson River Downs sub-region, which is 93,330.4 ha or 9.5% of the pre-clearing extent (Accad *et al.*, 2019).

The Project will impact 10.1 ha of remnant vegetation, which represents approximately 0.01% of the current extent of remnant vegetation in the sub-region. The area of remnant vegetation proposed to be impacted/cleared is composed of 0.1 ha of concern RE (RE 11.3.3) and 9.9 ha of least concern REs (REs 11.3.25, 11.5.9 and 11.5.15).

The Baralaba North Continued Operations Project located approximately 11 km north of the Project, was approved in 2014. The EIS (Cockatoo Coal Limited, 2014), estimated a total of 277 ha of remnant vegetation would be cleared for the expansion of the existing mine (Cockatoo Coal Limited, 2014b). The Dawson Mine is located approximately 25 km to the south of the Project; however, the extent of approved vegetation clearance is not publicly available.

Cumulatively, direct impacts on native vegetation from developments including other mining projects in the region will result in incremental losses and modification of remnant vegetation, including TECs and habitat for species of conservation significance. Vegetation clearing for mining and infrastructure projects can interrupt connectivity between areas of habitat, leading to reduced opportunities for fauna to successfully forage, breed and colonise new territories. Fragmenting habitat can also affect genetic diversity by limiting opportunities for breeding individuals to interact, as well as pollinating and dispersing plant propagules.

Implementing biodiversity offsets in accordance with Commonwealth and/or state government policies provide an opportunity to mitigate cumulative impacts. Offsets were required for the Baralaba North Continued Operations Project and will also be provided for the Baralaba South Project to compensate for significant residual impacts to matters of environmental significance and to yield a no net conservation loss.

The Groundwater Modelling and Assessment (Appendix B) concluded that there is unlikely to be any interaction between groundwater drawdown at the Project and that associated with the Baralaba North Mine, or any other mining tenure in the vicinity. Thus, the predicted groundwater drawdown impacts would be equivalent to those modelled for the Project alone. Hence at a cumulative level, any potential drawdown impacts on GDEs would not propagate beyond the drawdown contours modelled for this assessment.

The cumulative impacts of the Baralaba South Project and the Baralaba North Mine and Dawson Mine on the hydrology of the Dawson River and tributaries have been modelled. In summary, these assessments concluded that there would be negligible cumulative impacts to the Dawson River streamflow (a reduction of approximately 0.04% in mean annual flow) (Appendix A, Surface Water Impact Assessment). This minor reduction is not predicted to result in changes to the extent or availability of preferred Fitzroy River Turtle habitat, such as riffles and runs, downstream of the Neville Hewitt Weir.

## 7.9 Mitigation and management measures

To manage potential impacts on flora and fauna values as a result of the Project, the following framework has been adopted for the Project and is consistent with the recommended 'management hierarchy' from the DES:

- avoid impacts whenever possible;
- minimise unavoidable impacts; and
- when necessary, offset significant residual impacts.

The avoidance, mitigation and management measures detailed in the following sections for the Project have been developed in consideration with the 'SMART' principle (Specific, Measurable, Achievable, Relevant, Time-bound).

Avoidance, mitigation and management measures for the Project have been grouped according to the nature of the potential impact and the proposed activity. These mitigation and management measures have been categorised as those relating to habitat and vegetation disturbance and those relating to site operational impacts.

### 7.9.1 Habitat and vegetation disturbance

#### 7.9.1.1 Vegetation clearing protocols

The following controls for clearing activities are proposed to minimise and mitigate impacts on flora and fauna habitats, and vegetation communities, including the risk of injury or death to native fauna:

- Clearing activities will be undertaken sequentially and in accordance with the 'Permit to Disturb' process whereby any disturbance that involves individual trees (dead or alive), vegetation and soil disturbance will require an approval from the Environmental Officer. This protocol will ensure the area of vegetation and habitat to be cleared is that which is required for the safe construction and operation of the Project.
- During clearing activities vegetation will be felled in the direction of the clearance zone to avoid impacts to adjoining retained vegetation and habitat.
- When possible, clearing activities will be designed to be undertaken outside of peak breeding periods for threatened fauna species.
- When possible, important habitat values such as hollow-bearing trees and fallen logs will be retained or salvaged during clearing activities and used for fauna habitat in rehabilitated areas. For example, the proposed clearing associated with the development of the water release/extraction infrastructure will be designed to avoid the removal of any habitat trees within the remnant vegetation areas (RE 11.3.25).
- Environmental buffer areas and relocation areas will be clearly delineated prior to the start of clearing activities. Access to these areas will be limited to minimise disturbance to the protected values.
- Controls will be installed to prevent unauthorised access into areas of vegetation to be retained and to prevent any damage to these values during clearing activities.
- Sediment control works will be considered and implemented where necessary during clearing activities; for example, in areas where remnant pools are located adjacent to construction activities.
- Any necessary rehabilitation of drainage features and/or watercourses will be undertaken using native flora species.
- All staff and contractors will be required to notify the Environmental Officer of any incidents of accidental damage to vegetation or injury/death of fauna during clearing activities.
- Appropriate control measures would be implemented if there was any instance of unauthorised clearing/injury or death of native fauna, whereby the Environmental Officer may order a 'stop work' to resolve and assess the obligation to report any such incident to the regulatory authorities.

Whenever possible, an environmental buffer area will be retained to protect nearby watercourses and wetlands and enhance water quality and habitat connectivity. The 'Regional Vegetation Management Code for the Brigalow Belt and New England Tablelands Bioregions' (DERM, 2009) recommends a high bank buffer of:

- 50 m for stream order 1 or 2 watercourses;
- 100 m for stream order 3 or 4 watercourses; and
- 200 m for stream order 5 or greater watercourses.

Consistent with the 'Regional Vegetation Management Code for the Brigalow Belt and New England Tablelands Bioregions' (DERM, 2009), a buffer of 500 m along the Dawson River and a 200 m buffer along the Banana Creek will also be retained. Significant earthworks and clearing will be avoided within these buffer areas. Minor surface disturbance, such as pipelines, tracks and monitoring infrastructure, may occur within these buffer areas.

#### **7.9.1.2 Pre-clearing inspections**

Inspection of areas to be cleared will be undertaken prior to clearing to confirm whether any animal breeding places for threatened or near threatened species are present or likely to be present. If breeding places for threatened or near threatened species are present or likely to be present, the Project will engage a spotter/catcher to manage the potential impacts to fauna during the clearing activities.

#### **7.9.1.3 Conservation significant species management**

A Species Management Program will be developed and implemented during construction and mining operations. The purpose of this plan is to manage and minimise the risk of impacts on animals and animal breeding places protected under the *Nature Conservation (Animals) Regulation 2020*. The Species Management Program will be developed to address the key threatened processes identified for the species relevant to the Project.

The Species Management Program will be used in conjunction with the 'Permit to Disturb' protocol that will be implemented during both construction and operations stages of the Project. The Species Management Program will set out the specific commitments and/or requirements to be implemented prior to and during vegetation clearing, which may include the following:

- Any clearing activities planned within areas known to contain threatened plant species or within an area mapped as 'high risk' in the Flora Survey Trigger Map will require a Protected Plants Survey as per the requirements of the Nature Conservation (Plants) Regulation 2020. Any Protected Plants Surveys will be conducted in accordance with the requirements of the Nature Conservation (Plants) Regulation 2020. Where required a protected plants clearing permit will be obtained prior to clearing any protected plants, or an exempt clearing notification submitted to the Department of Environment and Science.
- The level of survey effort and methodologies required for pre-clearance survey(s), for example the type of trapping to be undertaken including the number of nights prior to clearing activities, or the identification of breeding/nesting habitat values in order to avoid impacts to animal breeding places.
- During pre-clearance surveys and clearing activities, a suitably qualified fauna spotter-catcher (as per the requirements of the Nature Conservation (Animals) Regulation 2020) is to be present.
- Targeted fauna searches by a suitably qualified fauna spotter-catcher to identify known and/or likely to occur conservation significant species in areas mapped as habitat within the proposed clearing areas; for example, searches for the Ornamental Snake, Australian Painted Snipe, Koala, Squatter Pigeon (Southern), Greater Glider and Short-beaked Echidna.
- Specific protocols for handling and relocating various fauna species encountered prior to or during clearing activities.



- Information regarding suitable approaches and specific clearing techniques to minimise disturbance to fauna habitats and populations; for example, the timing of clearing activities to occur outside of the known/likely to occur conservation significant species breeding seasons.
- Where possible, disturbances to significant habitat values (e.g. hollow-bearing trees and logs) will be avoided during clearing activities. In areas where disturbances cannot be avoided, where possible, these habitat values will be relocated or substitution of nesting features (e.g. hollows and logs) will be placed in suitable areas.
- Procedures regarding the management and reporting of any fauna interactions resulting in the injury or mortality of wildlife on-site.
- Protocols for the treatment and rehabilitation of injured wildlife; these protocols will include requirements around emergency euthanasia and information regarding wildlife carers.
- Protocols around the management of any conservation significant species habitat values or populations not previously identified within the Project area or within the adjacent properties (Broadmeadow Property). These protocols will include measures such as disturbance avoidance, property management strategies (e.g. grazing practices) and/or monitoring measures.
- Requirements around any conservation significant species monitoring within the Project area, offset areas or within Project owned properties (Broadmeadow Property).

The Species Management Program will describe the individual responsibilities of personnel (employees and contractors) to operate in accordance the program, such that roles would include but not be limited to:

- Manager - obtaining all relevant approvals and permits necessary prior to the occurrence of any vegetation clearing activities.
- Site Senior Executive - ensuring all workers are trained and competent to perform relevant duties and maintain an acceptable level of risk under the plan;
- On-site Environmental Officer - implementing the plan on-site, including communications with site supervisors to confirm pre-clearing, clearing and construction activities are undertaken in accordance with the plan; and
- suitably qualified and experienced person(s) - undertaking pre-clearance surveys in accordance with the plan.

The plan will be reviewed for its effectiveness in the event of any changes made to legislative requirements.

Internal audits and an independent evaluation will inform compliance of the program. Where future recommendations resulting from audits are identified, management measures to address the recommendations will be implemented.

#### **7.9.1.4 Watercourse/waterway crossings**

All road crossings, and any watercourse crossings for linear infrastructure, will be designed in consideration of the 'Accepted development requirements for operational work that is constructing or raising waterway barrier works' (DAF, 2018) to ensure that fish passage is maintained throughout these systems.

Construction will be undertaken with a Riverine Protection Permit, or consistent with the guideline's exemption criteria to ensure impacts to the aquatic environment are minimised. Where practical, crossings of waterways will be constructed in the dry season when waterways are dry, and rainfall is unlikely. Crossing locations will preferentially be selected in areas where the bank gradient is low, and where riparian vegetation in good condition can be avoided as far as practical. Ongoing impacts associated with erosion or failing banks can be mitigated by appropriate rehabilitation, including revegetation of banks with native plant species and bank stabilisation.

#### 7.9.1.5 Weed and pest management

A Weed and Pest Management Plan will be developed and implemented for the Project and will describe the measures required to manage weeds and feral animals as per the requirements of the *Biosecurity Act* and the identified key threatening process for the MNES values identified on-site. The Weed and Pest Management Plan will consider the Banana Shire Council's existing and planned management programs, and include:

- delivering education and awareness training about weeds and pest animals to all staff and contractors through site inductions;
- implementing the following prevention measures:
  - maintenance of roads and tracks to minimise weeds on tracks and reduce the spread of weeds by vehicle movements;
  - monitoring and managing as required topsoil stockpiles to ensure that they do not become infested with weeds;
- ensuring biannual pest monitoring is undertaken for the Project area by a suitably qualified person;
- designing and implementing appropriate treatment control programs to contain and reduce the extent of restricted pest weed species at the site and prevent the introduction of new species—this may involve chemical and mechanical methods, depending on the sensitivity of the receiving environment;
- monitoring weed infestations;
- rehabilitating unused areas as soon as possible to avoid the opportunistic spread of weeds;
- employees/contractors will be required to notify the Environmental Officer of any new sightings of pest species or new weed infestations;
- waste storage facilities associated with the Project will have restricted access to prevent any harmful contact with fauna; and
- a rubbish-free, clean environment will be upheld at all times to deter the presence of feral animals.

The Project will liaise with neighbours and local land managers to contribute, where practical, to a broader pest animal management program aimed at reducing the feral cat, wild pigs, wild dog and Red Fox populations in the region.

#### 7.9.1.6 Site rehabilitation

Chapter 3, Rehabilitation, details the timing and the nature of the rehabilitation activities for the Project. The general rehabilitation goals for the Project are to leave an area that is:

- safe to humans and wildlife;
- non-polluting;
- stable; and
- able to sustain an agreed post-mining land use.

These goals align with the relevant performance outcomes for land rehabilitation in the EP Regulation. In addition to the general rehabilitation goals listed above, further site-specific goals for the Project include:

- minimising the loss of pre-existing agricultural land value by reinstating, where possible, grazing lands at a similar suitability to that existing prior to mining;
- where this cannot be achieved, identifying alternative uses that provide a similar value to the value able to be generated from the land prior to mining or an alternative land use, or uses, able to provide long-term ecological value to the region; and
- minimising or avoiding the potential for post-mining lands having no or little value to the area or region.

In accordance with the post-mining land use identified within Chapter 3 Rehabilitation, and that land disturbance cannot be avoided for the Project, the rehabilitation objective is to return land to the previous land use, predominantly improved pasture grazing.

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue for three years post-production. Mining operations will commence in the north-west of the Project area and progress in a south-easterly direction. Rehabilitation will utilise suitable topsoils and subsoils stripped from construction and mining areas, and where viable, be stored to maintain soil quality and promote native vegetation from the soil seed bank. Areas of in-pit and out-of-pit spoil disposal will be rehabilitated as soon as they become available in the operating life. A rehabilitation strategy has been developed to achieve the relevant performance outcomes, minimise the loss of land and water bodies with ecological and productive value, and to ensure that high impact areas are capable of being managed and rehabilitated to achieve acceptable land use capability and suitability, to be stable and self-sustaining, and to prevent surface and groundwater contamination.

To assess the Project's rehabilitation activities, a rehabilitation monitoring program (RMP) will be developed. This RMP will detail the objectives, methodology, timing and frequency appropriate for the Project. The results of rehabilitation monitoring will be captured in monitoring reports.

A detailed summary of the proposed rehabilitation measures, and the rehabilitation strategy including success criteria, is provided in Chapter 3, Rehabilitation.

## 7.9.2 Site operations

Ongoing site operations of the Project have the potential to impact flora and fauna values. General Project site protocols as well as impact specific management plans, in relation to water management, bushfire management and equipment management are discussed below. In addition, the Proponent has, or will develop, the following management plans to mitigate impacts resulting from ongoing site operations:

- Air Quality Management Plan (Appendix M);
- A Noise and Blasting Management Plan as detailed in Chapter 12, Noise and Vibration;
- A Road Use Management Plan as detailed in Chapter 13, Transport; and
- A Topsoil Management Plan as detailed in Chapter 10, Land and Visual Amenity.

The management plans will consider potentially impacted fauna and flora values and will be designed using the management hierarchy. For example, impacts to fauna resulting from fauna strikes will be considered in the Road Use Management Plan, with mitigation measures such as the use of signage to indicate areas of high fauna traffic.

### 7.9.2.1 Water management

#### *Water management system*

The water management system has been developed to mitigate any adverse environmental impacts on water resources, and to detail planned infrastructure to store and manage several categories of water associated for the Project. The water management system for the Project has been developed to preserve the environmental values of the receiving environment and provide runoff containment and meet the water demands of the Project. The proposed water management strategy can be summarised as:

- Clean water will be diverted around mine infrastructure and disturbed land using diversion drains, and pumping from upstream clean storages.
- Mine affected runoff will be contained in dedicated storages for reuse.

- Runoff from disturbed areas will be captured and treated in sediment basins and other sediment control infrastructure.
- Catchment runoff reporting to the mining pit will be minimised.
- Re-use of mine affected water and sediment runoff will be preferentially captured by the Project to supply operational water demands (dust suppression and CHPP demands).
- Progressive rehabilitation/stabilisation of waste rock emplacements and mine infrastructure areas will be undertaken to reduce sediment runoff.

The mine water management system includes managing mine affected water storages, sediment storages, clean water storages and drainage diversions for undisturbed catchments.

### *Water management plan*

A water management plan will be prepared for the Project, in accordance with the DES guideline for the 'Preparation of water management plans for mining activities' (DEHP, 2012). It will include:

- a description of site activities relevant to water management;
- a description of the potential sources of contaminants that could impact on water quality;
- a description of the water management system;
- a description of the water release strategy;
- a description of the water balance model;
- a program for the monitoring and review of the effectiveness of the water management plan;
- mitigation, monitoring and management measures; and
- corrective actions and contingency procedures for emergencies.

Information from the water management plan will be included in the site induction and familiarisation training for relevant personnel. The Proponent will ensure employees and contractors involved with monitoring, maintaining and operating the water management infrastructure are appropriately trained.

An annual review of the water management plan will be undertaken. The water management plan will be updated pending the outcomes of the review process or updates/changes in legislative requirements.

Further details of the water management system and surface water components of the water management plan are provided in Chapter 4, Surface Water.

### *Receiving Environment Monitoring Program*

The Proponent will prepare a Receiving Environment Monitoring Program (REMP) for the Project in accordance with the 'Model Mining Conditions' (DES, 2017a) and in accordance with the 'Receiving Environment Monitoring Program Guideline' (DES, 2014a). The program will identify the following to assess aquatic ecosystem health:

- release characteristics (quality and quantity);
- environmental values of the receiving environment that may be affected by a release and need to be enhanced and protected under the EPP (Water and Wetland Biodiversity);
- spatial extent of suitable test sites (including the location of monitoring sites and a controlled background reference);
- temporal context (including timing and frequency of sampling);
- monitoring indicators (including physical, chemical and biological);



- water quality objectives to measure chosen indicators;
- methodologies; and
- quality control and assurance procedures.

The REMP will commence at the beginning of construction. Monitoring locations will include (at a minimum) upstream and downstream sites along the Dawson River and Anabranche, Banana Creek and within the HES wetland. A report of the findings from the REMP will be prepared annually to assess the state of the receiving waters and the aquatic ecosystem health over time and inform future management measures required.

#### *Surface water quality monitoring program*

A surface water quality monitoring program will be implemented for the Project. Monitoring of upstream, downstream and site water quality will be used to assess potential impacts on water quality. Monitoring will be undertaken at background (i.e. control) sites located upstream of the release point on the Dawson River and along Banana Creek. These sites are located outside the immediate zone of influence from the release location. Monitoring will also be undertaken at impact sites located downstream and within the potential zone of influence including downstream locations at the Dawson River and Banana Creek. Further details regarding this program including monitoring requirements and program design is detailed in Chapter 4, Surface Water.

#### *Groundwater monitoring program*

The existing groundwater monitoring program will continue throughout the life of the Project. Exceptions to this include existing bores within the disturbance footprint where monitoring will be maintained for pre-mining baseline data only. Two additional shallow alluvial bores have also been proposed, including one paired with the existing bore P-OB1 and one near the HES wetland. Further details regarding this program including monitoring requirements and program design are detailed in Chapter 5, Groundwater.

#### *Discharge of mine affected water*

A controlled release strategy is proposed to ensure conditions in the receiving waterway will comply with regulator-imposed release limits and other relevant conditions (i.e. minimum flow thresholds); and to prevent mine water accumulating on-site and reducing the risk of uncontrolled releases to natural waterways.

Controlled releases of mine affected water from site will only occur where the storage capacity of the site water management system is exceeded. Baseline water quality monitoring will be undertaken to characterise ambient water quality in watercourses of the Project area prior to mine construction. These results will inform the developing appropriate contaminant limits and establishing a benchmark for operational phase water quality monitoring. The controlled release strategy will ensure mine affected water is only released when conditions in the receiving waterway allow water quality to be maintained at levels that achieve the determined WQOs.

#### *Erosion and Sediment Control Plan*

An erosion and sediment control plan detailing design and maintenance requirements will be prepared in accordance with EA requirements, to manage erosion and sediment control measures implemented in association with the Project.

Sizing of erosion and sediment control structures will be undertaken in accordance with the 'Best Practice Erosion and Sediment Control guideline' (IESC, 2018), which provides guidance on sediment basin sizing and operation. Further details on sediment basin sizing is provided in Appendix A, Surface Water Assessment. The erosion and sediment control plan will define the aspects of the erosion sediment control requirements for the site, including:

- limiting disturbance to prevent sediment runoff generation;

- installing erosion control measures such as revegetation and rehabilitation, to prevent soil erosion from disturbed areas;
- documenting soil types and disturbed catchment areas on the site and their potential for sediment generation;
- designing and managing drainage control measures to prevent erosion from concentrated flows and manage the flow of both clean water and sediment runoff;
- Installing erosion and sediment control requirements for temporary disturbance and construction activities;
- designing and managing sediment dams, including dewatering and desilting requirements and using suitable construction materials; and
- water quality testing sediment dams to assess their performance and inform continual improvements of the erosion and sediment control system.

#### **7.9.2.2 Equipment maintenance**

The exposure of fuels, oils and other chemicals (e.g. lubricants and solvents) is known to have a toxic effect on aquatic flora and fauna. Appropriate procedures, containment and spill control measures, to ensure aquatic habitat quality is maintained during construction and operations will be implemented. This will include at appropriate locations where transporting and loading, and storing materials will occur on-site.

Appropriate storage of chemicals and hydrocarbons will be required as part of ongoing operations as well as a dedicated fuel and lube facility, which will be constructed to provide adequate containment and spill response. Storing and using fuels, oils and batteries within the MIA will be in accordance with 'Australian Standard (AS) 1940 (2017)—The Storage and Handling of Flammable and Combustible Liquids'. Operating and managing vehicles and equipment will include, but not be limited to, the following controls:

- vehicle and machinery refuelling and maintenance will be restricted to bunded areas positioned above the 0.1% AEP flood level;
- appropriate and accessible spills kits will be available throughout the site;
- a spill notification standard operating procedure will be implemented;
- pipeline gauges will be installed to measure flow and/or pressure;
- early leak detection alarm systems will be installed; and
- staff operation, monitoring and maintenance procedures will be implemented.

#### **7.9.2.3 Bushfire prevention and management**

A series of bushfire prevention management measures will be implemented for the Project. These include, but are not limited to:

- retaining adequate fire breaks between the surrounding bushland and the Project with buffers in accordance with the approved disturbance footprint;
- ensuring all flammable chemicals are handled and stored to avoid spills/leaks that could result in increased fire risk;
- maintaining access tracks to ensure available use for firefighting and Queensland Fire and Emergency Service; and
- implementing an Emergency Response Plan to include the following fire management measures:
  - emergency incident response;
  - training requirements for emergency response crews, including rescue, first aid, firefighting etc.; and
  - appropriate communication protocols.

## 7.10 Residual impacts

Significance impact assessments on MNES and MSES as a result of the Project have been undertaken. The assessments considered both the direct and indirect impacts of the Project, as discussed in section 7.8 as well as the impact mitigation and management measures, described in section 0.

A condition to undertake an environmental offset can only be imposed, in relation to a MSES, at the state level where the same or substantially same impact has not already been assessed under a Commonwealth Act (i.e. the EPBC Act). Therefore, to avoid duplication of assessments for matters listed as both MSES and MNES, dual listed species and communities will be assessed using the 'MNES Significant Impact Guidelines 1.1' of the EPBC Act (DoE, 2013a) and residual MSES will be assessed using the 'Queensland Environmental Offsets Policy Significant Residual Impact Guideline' (DEHP, 2014).

### 7.10.1 Matters of national environmental significance

For those MNES that were identified as having the potential to be significantly impacted by the Project, 'significant impact assessments' were conducted pursuant to the Commonwealth 'MNES Significant Impact Guidelines 1.1' of the EPBC Act (DoE, 2013a), and include the following:

- Threatened Ecological Communities:
  - Brigalow (*Acacia harpophylla* dominant and codominant) TEC;
- Groundwater Dependent Ecosystems;
- Conservation Significant Flora Species:
  - *Xerothamnella herbacea*;
- Conservation Significant Fauna Species:
  - Ornamental Snake, Squatter Pigeon (Southern), Australian Painted Snipe, Glossy Ibis, Latham's Snipe, Koala, and the Fitzroy River Turtle; and
- Migratory birds.

The impact assessments undertaken for each terrestrial and aquatic MNES listed above are provided in the following sections. and Appendix F, Terrestrial Ecology Assessment, Appendix G, Aquatic Ecology Assessment and Appendix H, Groundwater Dependent Ecosystem Assessment.

Significant impacts were identified to occur as a result of the Project for the following matters:

- *Xerothamnella herbacea*; and
- Ornamental Snake (*Denisonia maculata*).

The offset requirements for these matters are discussed in section 7.11 and further details regarding the Project MNES values, impact assessments, and offset commitments are provided in Chapter 9, Matters of National Ecological Significance.

#### 7.10.1.1 Brigalow (*Acacia harpophylla* dominant and codominant) Threatened Ecological Community

##### Description

The Brigalow TEC is characterised by a range of open forests and woodland, which are dominated by Brigalow (*Acacia harpophylla*) trees and shrubs. The community ranges in structure although usually occurs on acidic and salty clay soils (DoE, 2013b). This TEC comprises both remnant and regrowth vegetation in Queensland and New South Wales and in Queensland is represented by a number of REs in the Brigalow Belt, South-east Queensland bioregions, but primarily occurs in the Brigalow Belt Bioregion (Environment Australia, 2001).

### **Current threats**

The main threats to Brigalow TEC are those activities that reduce its extent, cause a decline in the condition of the vegetation or impede its recovery, including:

- clearing particularly for mining and agricultural activities;
- fire, particularly where exotic grasses are present within or adjacent to the remnant;
- plant and animal pests, particularly by exotic pastures and in combination with clearing. Other pest plants include *Opuntia* spp., Mother-of-millions (*Bryophyllum delagoense*) and Asparagus Fern (*Asparagus* spp.); as well as grazing by cattle and native herbivores; and
- lack of knowledge about climate change, how to best manage plant and animal pests and how to restore degraded communities (DCCEEW, 2023).

### **Management plans**

The following plans and advice are in place for the Brigalow TEC and have been considered in preparing this assessment:

- Conservation Advice: Approved Conservation Advice has been prepared for the Brigalow TEC, which outlines key diagnostic criteria and condition thresholds for the communities as well as threats and priority conservation actions required for the TEC. The Conservation Advice is an important consideration in the assessment of impacts to the Brigalow TEC and defines all patches of Brigalow vegetation that meet the key diagnostic criteria and condition thresholds as being considered critical to the survival of the Brigalow TEC.
- Threat Abatement Plan: Threat abatement plans are listed for the Cane Toad in relation to this TEC.
- Recovery Plan: There is currently no recovery plan for the Brigalow TEC.
- Referral Guideline: There are no referral guidelines for the Brigalow TEC. There is an information sheet, for Queensland purposes only, regarding clearing of Brigalow regrowth under the EPBC Act.

### **Survey effort**

Seasonal field flora surveys were undertaken over 23 days and carried out in compliance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Versions 5.1, 5.0 and 4.0, current at the time of the field surveys (Neldner *et al.* 2020; 2019; 2017b). Assessment sites were performed throughout the study area to thoroughly assess the vegetation present.

The validation and mapping of remnant vegetation was undertaken at a total of 132 vegetation assessment sites and 102 quaternary photo points across all flora surveys (Figure 7.2). Of the 132 vegetation assessment sites, 11 were detailed secondary sites, 68 tertiary sites and 53 quaternary sites (Figure 7.2).

The flora surveys were designed to assess the structural and floristic characteristics of Brigalow communities within the study area against the relevant DAWE TEC condition thresholds and diagnostic criteria. The secondary and tertiary sites completed within these vegetation types were considered sufficient to assess whether the communities satisfy the condition criteria.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area are provided in Appendix F, Terrestrial Ecology Impact Assessment.

### **Survey outcomes and habitat assessments**

Areas of Brigalow vegetation were recorded within the Project site and many of these patches, although not all necessarily meeting remnant or regrowth status, exhibit the key diagnostic features and meet the condition thresholds of the EPBC Act listed endangered Brigalow TEC. These patches are comprised of vegetation



representing REs 11.3.1 and 11.4.9a. A total of 43.6 ha of Brigalow TEC has been identified in the study area, including 4.1 ha within the Project site and 9.9 ha in the ETL study area. However, this TEC does not occur in the water release/extraction infrastructure area or road realignment.

Patches that meet the key diagnostic characteristics and condition thresholds for the TEC are considered to be critical to the survival of the Brigalow TEC (TSSC, 2013b). Therefore, the Brigalow TEC within the study area is critical habitat for this TEC.

### *Impact assessment*

The Project would result in the clearing of 1.4 ha of Brigalow TEC.

Indirect impacts to this TEC are considered unlikely. Indirect impacts related to noise and vibration, dust, lighting, erosion and sedimentation will be temporary, able to be managed and therefore minimal. Due to the already fragmented nature of the patches of this TEC in the landscape, edge effects and fragmentation are not expected to be significant and remaining patches of TEC in the Project area are not proposed to be impacted by changes in surface water or flooding regimes.

There will be no facilitated impacts as a result of the Project.

Based on Queensland Government remnant RE mapping, there is approximately 14,687.9 ha of REs that potentially represent the Brigalow TEC in the Dawson River Downs sub-region, in which the Project area is located (Accad *et al.*, 2019). This is likely to be an underestimation of the extent of Brigalow TEC given the mapping does not capture all regrowth vegetation, remnants of greater than 5 ha or less than 75 m in width (Neldner *et al.*, 2017a). The proposed impact of 1.4 ha accounts for approximately 0.01% of Brigalow TEC in the sub-region in which the Project area is located and this is considered unlikely to significantly contribute to cumulative impacts to this TEC in the sub-region.

### *Avoidance, mitigation and management*

Impacts to some areas of Brigalow TEC cannot be avoided due to the location of the coal seams, however, impacts to Brigalow patches along the ETL study area will be avoided where possible as part of the detailed design and siting of the proposed ETL.

Plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near retained Brigalow TEC:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- a Weed and Pest Management Plan; and
- an Erosion and Sediment Control Plan.

### *Rehabilitation requirements*

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank. Revegetation will be also undertaken where required across the mine site.

*Significant impact assessment*

Table 7.15 provides an assessment of the significance of impacts to the Brigalow TEC against the Commonwealth Significant Impact Guidelines.

*Table 7.15: Assessment of significance of impacts for the Brigalow Threatened Ecological Community (Acacia harpophylla dominant and codominant)*

Significance criteria	Assessment of significance
<p>An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:</p>	
<ul style="list-style-type: none"> <li>• reduce the extent of an ecological community</li> </ul>	<p>The Project will result in the clearing of 1.4 ha of Brigalow TEC. Based on Queensland Government remnant RE mapping, there is approximately 14,687.9 ha of REs that potentially represent the Brigalow TEC in the Dawson River Downs sub-region, in which the study area is located (Accad <i>et al.</i>, 2019). This is likely to be an underestimation of the extent of Brigalow TEC given the mapping does not capture all regrowth vegetation, remnants of &lt; 5 ha or &lt; 75 m in width (Neldner <i>et al.</i>, 2017). As a result of the history of clearance in the Brigalow Belt, many remaining Brigalow TEC remnants are formed by narrow linear strips within road reserves and are therefore often not captured in the Queensland Government mapping. Overall, this proposed impact of 1.4 ha accounts for approximately 0.01% of Brigalow TEC in the region in which the Project area is located.</p>
<ul style="list-style-type: none"> <li>• fragment or increase fragmentation of an ecological community, for example by clearing vegetation for road or transmission lines</li> </ul>	<p>Patches of Brigalow TEC within the Project site are small and isolated and would be totally removed as a result of the Project. There is potential for the ETL to fragment TEC patches, whereby a 20 m wide easement may traverse one or both patches within the ETL study area. However, this is unlikely to significantly increase fragmentation of this TEC given the already highly fragmented nature of these isolated patches.</p>
<ul style="list-style-type: none"> <li>• adversely affect habitat critical to the survival of an ecological community</li> </ul>	<p>The Brigalow TEC within the Project area is considered unlikely to represent habitat critical to the survival of the community as it is unlikely to be necessary for activities such as breeding or dispersal, long-term maintenance of the community, maintaining genetic diversity or recovery of the community.</p>
<ul style="list-style-type: none"> <li>• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soils) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns</li> </ul>	<p>Impacts to this TEC will be confined to the Project site and ETL study area. There are limited patches of this TEC immediately downstream or adjacent to the Project area. A number of controls will be put in place to maintain environmental surface water flows downstream and prevent erosion and sedimentation of surface waters. Changes to the flooding regime are predicted to be minor and are unlikely to affect floodplain communities. Additionally, Brigalow TEC in the Project area is unlikely to be groundwater dependent. Therefore, the Project is not predicted to give rise to impacts on surface water or groundwater that would impact Brigalow TECs that will remain in or adjacent to the Project area.</p>
<ul style="list-style-type: none"> <li>• cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting</li> </ul>	<p>Impacts proposed to the Brigalow TEC as a result of the Project are in the form of clearing rather than modification.</p>

Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>• cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:                             <ul style="list-style-type: none"> <li>○ assisting invasive species, that are harmful to the listed ecological community, to become established, or</li> <li>○ causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community</li> </ul> </li> </ul>	<p>The Project area is located within a highly modified rural landscape where introduced plants (e.g. Buffel Grass and pest animals, e.g. European Rabbit) are already present and were identified as part of the field surveys. The Project is considered unlikely to increase the threat of these already established invasive species in the landscape. Additionally, the Project is unlikely to result in mobilisation of pollutants of any kind into this TEC within or adjacent to the Project area. A Weed and Pest Management Plan will be developed and implemented for the Project to manage weeds and feral animals. The plan will identify appropriate treatment control programs, that are selected in consideration of the sensitivity of the environment in which they are to be applied. A site Water Management Plan, Erosion and Sediment Control Plan and Receiving Environment Monitoring Program will also be implemented to maintain surface water quality.</p>
<ul style="list-style-type: none"> <li>• interfere with the recovery of an ecological community.</li> </ul>	<p>Approximately 4.6 ha of Brigalow TEC is proposed to be cleared for the Project. There is currently no recovery plan for the Brigalow TEC.</p>
<p><b>Conclusion</b></p>	<p>The proposed clearing of 1.4 ha of Brigalow TEC for the Project is not considered to have a significant residual impact on the TEC due to the small amount of clearing that is proposed and the small and isolated nature of the patches in the landscape context.</p>

#### 7.10.1.2 Groundwater dependent ecosystems

Drawing on information on GDE presence and function from previous sections, a risk assessment has been prepared which presents the likelihood of an impact occurring and the consequence associated with that impact.

The tables of likelihood and consequence applied to the risk assessment are detailed in Appendix H, Groundwater Dependent Ecosystem Assessment. The outcome of the risk assessment with a residual risk score is provided in Table 7.16. Based on risk assessment protocols described in Doody *et al.* (2019) and the Queensland guideline ‘Groundwater dependent ecosystems: EIS information guideline’ (DES, 2022), all GDE areas identified within this assessment are considered ‘High-Value’ ecological receptors. This is due to the attribution of conservation values recognised as significant under relevant Qld legislation (e.g., RE 11.3.3 which is classified as of concern under the VM Act), or their classification as essential habitat for threatened wildlife listed under either the NC Act or other prescribed environmental matters under the EPBC Act. Further discussion regarding the habitat values of these areas is provided in Appendix G, Aquatic Ecology Assessment.

As there is no direct causal pathway identified that may result in impact to GDEs in the vicinity of the Project, it is considered sufficient that ongoing monitoring of groundwater levels and quality and surface water quality, as described in section 7.9.2.1 will provide a management measure that is sufficiently robust to underpin detection of potential changes to GDE function that may be attributed to mine related groundwater drawdown or contamination.

As such the Project is not expected to be a significant impact on GDEs.

Table 7.16: Risk assessment for potential impacts to GDEs and residual risk scores

Impact pathway	Pre-mitigated risk			Comments	Mitigation measures	Residual risk ranking		
	Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
Direct clearing of a GDE	5	Severe	Low	No area of confirmed groundwater dependent vegetation will be cleared for the Project.	GDE Avoidance	1	Severe	Insignificant
A total or partial loss or reduction in the volume or pressure of the aquifer being utilised by GDEs.	2	Negligible	Insignificant	The sandy lenses that support GDEs on a seasonal basis are not hydraulically connected between lenses and not connected to the regional alluvial aquifer or the aquifer supported by the Permian sediments/coal seams.	Groundwater monitoring	1	Negligible	Insignificant
A change in the magnitude and timing of volume fluctuations in the aquifer being utilised by GDEs <sup>1</sup> .	2	Negligible	Insignificant	Volume fluctuations in the perched groundwater system are regulated by surface flows and local surface water infiltration. These processes will not be impacted during mine development. While minoring drawdown is modelled within the alluvium underlying Banana Creek, this drawdown will only be propagated during periods where there is a hydraulic connection between surface flows and groundwater. In this instance, the impact of drawdown and the induced leakage would likely be negligible in comparison to the rate of groundwater recharge	Groundwater monitoring	1	Negligible	Insignificant



Impact pathway	Pre-mitigated risk			Comments	Mitigation measures	Residual risk ranking		
	Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
Changes to the interaction between surface flows and aquifers being utilised by a GDE.	2	Low	Low	No significant changes to surface flows on either Banana Creek or the Dawson River are predicted throughout the life of the mining operation.	Water Management Plan Erosion and Sediment Control Plan Groundwater monitoring	1	Low	Insignificant
Change in chemical composition of an aquifer detrimentally impacting the health of a GDE.	2	Low	Low	Uncontrolled releases of mine water that has potential to impact the chemical composition of infiltrating surface waters will not occur during the life of the mine.	Water Management Plan Erosion and Sediment Control Plan Groundwater monitoring	1	Low	Insignificant

<sup>1</sup>. Assumes freshwater aquifers/groundwater with EC < 1,500 µS/cm. Withdrawal of saline aquifers/groundwater may have a positive impact on vegetation/habitat condition of a GDE

### 7.10.1.3 *Xerothermella herbacea*

#### *Description*

The listing advice for *Xerothermella herbacea* indicates that it is known from two sites north-east of Chinchilla, a single record from near Theodore and a record near Yelarbon east of Goondiwindi, Queensland (TSSC, 2008a). However, large populations of this species have been recorded within the Moura and Biloela regions in recent years (Appendix F, Terrestrial Ecology Assessment). This species occurs in Brigalow dominated communities in shaded situations, often in leaf litter and is often associated with gilgais (shallow ground depressions). Soils are generally heavy, grey to dark brown clays (TSSC, 2008a).

#### *Current threats*

Current known threats to *X. herbacea* include competition by invasive plants, particularly Green Panic and Buffel Grass, which occupy similar habitats and locations. These plants can outcompete *X. herbacea* and increase fire fuel loads and alter fire regimes in habits in which this species occurs (TSSC, 2008a).

Potential threats have also been identified such as road widening, surface erosion, grazing and trampling by cattle and native macropods (TSSC, 2008a).

#### *Management plans*

There are no management plans or recovery plans in place for this species. The Australian Government provides the following plans and advice for *X. herbacea*, which have been considered in preparing this assessment:

*Conservation Advice: approved conservation advice has been prepared for X. herbacea, which provides priority research and management actions for the species, as well as specifying key threats.*

#### *Survey effort*

Seasonal field flora surveys were undertaken over 23 days and carried out in compliance with the 'Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Versions 5.1, 5.0 and 4.0', current at the time of the field surveys (Neldner *et al.* 2020; 2019; 2017b). Assessment sites were performed throughout the study area to thoroughly assess the Queensland Government mapped remnant vegetation. An additional day of field survey was focused on assessing population distribution and abundance of threatened flora previously identified within the Project site, including *X. herbacea*.

Detailed flora species lists were collated at all secondary sites (Figure 7.2) and traverse lists were compiled to account for additional species that were recorded outside of the secondary site plots. Large portions of the study area were traversed on foot and the random meander technique applied (Cropper, 1993). This method is essential for the detection of cryptic, pest and other significant species. This method was supplemented with 'educated walks' (Garrard *et al.*, 2008) in habitat areas that possessed a higher likelihood of supporting threatened flora species.

Significant flora species listed under the EPBC Act and NC Act that were recorded or predicted to occur from database searches were reviewed and, where relevant, formed the focus of targeted flora species surveys. Detailed traverses of habitat considered suitable for significant flora species were undertaken.

Areas identified as high risk for the presence of significant plants on the protected plants flora survey trigger map were assessed using the Queensland Flora Survey Guidelines - Protected Plants Versions 2.01 and 2.0, current at the time of the field surveys (DEHP, 2016b; DES, 2019h). This guideline requires the timed meander method to be employed in areas of high risk.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area are provided in Appendix F, Terrestrial Ecology Assessment.

### *Survey outcomes and habitat assessments*

A population of approximately 90 individuals of this species was recorded in ten locations within a fragmented and considerably degraded patch of non-remnant Dawson River Gum scrubby open woodland (RE 11.4.8) in the central eastern portion of the Project site (Figure 7.9). This species was recorded during the late dry season survey (December 2017) following moderate rainfall totals delivered during spring storms prior to the survey.

The number of individuals present at each location was low and ranged from one individual to approximately 20 individuals.

The woodland community was markedly fragmented with dead stags common throughout the canopy layer. The shrub layer was comprised of vine thicket species such as Scrub Boonaree, Stiff-leaved Denhamia, Wild Lime and Wallaby Apple (*Pittosporum spinescens*). Cattle grazing was prevalent and an ongoing disturbance throughout the area, which has led to the fragmentation of the shrub layer and weed infiltration throughout much of the ground layer.

There is potential for a mixed community of RE 11.3.1/11.3.3 along Banana Creek in the south of the additional investigation area to support this species (Figure 7.7). However, this species was not recorded in this habitat despite extensive searches in this area.

Populations of this species are not known from projects within the region (i.e. within 25 km of the Project site) and the population within the Project site is near the northern limit of this species distribution. Eco Solutions & Management knows of this species occurring east of Moura in the vicinity of the Baralaba Mine Train Load Out facility approximately 30 km south of the Project area, as well as a very large population of more than 78,000 individuals at a location approximately 40 km south-east of the Project area.

### *Impact assessment*

The Project will result in the removal of all individuals of this species within the population identified in the Project site.

Indirect impacts to the population within the Project site are not relevant given the population will be removed. Indirect impacts to any other populations in the region related to dust, erosion and sedimentation are unlikely as these will be temporary, or able to be managed and any surrounding populations would be separated by greater than 200 m from Project activities. No populations or potential habitat is proposed to be fragmented. Potential surface water, flooding and groundwater impacts are unlikely to significantly affect the Dawson River or Banana Creek.

There will be no facilitated impacts as a result of the Project.

There is no publicly available information about impacts to this species as a result of other Projects in the region.

### *Avoidance, mitigation and management*

Impacts to the population of *X. herbacea* within the Project site cannot be avoided due to the location of the coal seams.

A comprehensive groundwater monitoring network is proposed for the duration of the Project to allow early identification of changes in vegetation condition outside of the Project area that may have resulted from Project activities, e.g. changes in groundwater conditions, surface water flows or the flooding regime. This will be relevant to vegetation along the Dawson River and Banana Creek that although unlikely, have the potential to support populations of this species.

**Rehabilitation requirements**

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank.

Revegetation will be also undertaken where required across the mine site.

**Significant impact assessment**

Table 7.17 provides an assessment of the significance of impacts to *X. herbacea* against the Commonwealth Significant Impact Guidelines.

Table 7.17: Assessment of significance of impacts for *Xerothamnella herbacea*

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
<ul style="list-style-type: none"> <li>lead to a long-term decrease in the size of a population</li> </ul>	The Project will result in clearing of all individuals within the population of <i>X. herbacea</i> identified in the Project site.
<ul style="list-style-type: none"> <li>reduce the area of occupancy of the species</li> </ul>	This species has a restricted distribution in central Queensland and there are very few published records of this species. Eco Solutions & Management is aware of a number of other records within the larger locality, including a very large population of more than 78,000 individuals approximately 40 km south-east of the Project area. However, the population within the Project site is nearing the northern limit of this species' known distribution and removing this population has the potential to reduce the area of occupancy of the species.
<ul style="list-style-type: none"> <li>fragment an existing population into two or more populations</li> </ul>	There is only one population within or adjacent to the Project area, although other populations are known within 30 km south of the Project area along the Dawson River (C. Hansen pers. comm.). The clearing of this population will not result in fragmentation of a population.
<ul style="list-style-type: none"> <li>adversely affect habitat critical to the survival of a species</li> </ul>	There is no information about critical habitat for this species. There is currently no habitat for <i>X. herbacea</i> listed on the Commonwealth's Register of Critical Habitat. While the occurrence of this population in the Project site is near the northern limit of this species known distribution, there are other records and potential habitat for this species in the region. The population within the MLA is not considered critical to the survival of the species as it is unlikely to be necessary for activities such as breeding or dispersal, long-term maintenance of the species, maintaining genetic diversity or recovery of the species.
<ul style="list-style-type: none"> <li>disrupt the breeding cycle of a population</li> </ul>	This population would be cleared in its entirety therefore, there would be no opportunity to impact the breeding cycle of this population.



Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</li> </ul>	<p>There is limited habitat available for this species in the broader study area due to historic clearing of potentially suitable habitats and the extent of invasive grass species that dominant the ground layer throughout vegetated and non-vegetated areas of the study area. A small stretch of approximately 22.9 ha of RE 11.3.1/11.3.3 along Banana Creek is recognised as potential habitat for this species. However, this area was intensively searched during surveys and the species was not detected. No direct impacts to this additional potential habitat are proposed.</p> <p>Changes to the flooding regime are predicted to be minor and are unlikely to affect floodplain communities.</p> <p>Therefore, the Project is not expected to affect availability or quality of potential habitat areas along the Dawson River and Banana Creek.</p>
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat</li> </ul>	<p>The Project area is located within a modified rural landscape where introduced plants and feral animals are already present. Invasive species and feral animals such as Buffel Grass, Green Panic and Feral Pigs have been identified as part of field surveys in the study area. These invasive species already pose a threat to <i>X. herbacea</i> habitat within the study area and in the surrounding landscape and the Project is unlikely to increase this threat. Similarly, the Project is unlikely to introduce new invasive weed species that are not already present and established in the study area as controls will be put in place as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.</p>
<ul style="list-style-type: none"> <li>introduce disease that may cause the species to decline, or</li> </ul>	<p>Disease is not a known threat to <i>X. herbacea</i>. The Project is unlikely to introduce disease that may cause the species to decline.</p>
<ul style="list-style-type: none"> <li>interfere with the recovery of the species</li> </ul>	<p>There is currently no recovery plan for <i>X. herbacea</i>.</p>
<p><b>Conclusion</b></p>	<p>The Project is considered likely to have a significant impact on <i>X. herbacea</i> due to the clearing of a population that is near the northern limit of its known distribution.</p>

#### 7.10.1.4 Ornamental Snake

##### Description

The Ornamental Snake is found in close association with frogs, which form the majority of its prey. It is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions with clay soils but is also known from lake margins, wetlands and waterways (DCCEEW, 2022a).

The SPRAT profile and Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles specifically describe 'pure grassland associated with gulgais' and 'cleared areas formerly mapped as open forests to woodlands associated with gilgai formations and wetlands i.e. REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9 and 11.5.16' as suitable habitat for this species (DCCEEW, 2022a; SEWPac, 2011a).

The Ornamental Snake requires microhabitat features such as cracking clay soils, rotting logs or stumps, coarse woody debris, leaf litter or surface rock. These features are required because they either support the prey food of this species (i.e. frogs) or provide refuge habitat for the Ornamental Snake (DCCEEW, 2022a).

### *Current threats*

Current known threats to the Ornamental Snake include:

- habitat loss and fragmentation through clearing (roads, ploughing, railways, mining-related activities, pipeline constructions);
- habitat degradation by overgrazing by stock, especially cattle, or grazing of gilgai during the wet season leads to soil compaction and compromising of soil structure;
- alteration of landscape hydrology in and around gilgai environments;
- alteration of water quality through chemical and sediment pollution of wet areas;
- contact with the Cane Toad;
- predation by feral species; and
- invasive weeds (DCCEEW 2023a).

### *Management plans*

The following plans and advice are in place for the Ornamental Snake, which have been considered in preparing this assessment:

- Conservation Advice: Approved Conservation Advice has been prepared for the Ornamental Snake, which provides priority research and management actions for the species, as well as specifying key threats (TSSC, 2014).
- Recovery Plan: There is currently no Commonwealth recovery plan in place for this species. The DAWE SPRAT Profile identifies that a recovery plan is not required, as approved Conservation Advice provides sufficient direct for recovery of the species (DCCEEW, 2023).
- Referral Guideline: The Draft Referral Guidelines for the national listed Brigalow Belt reptiles outline important habitat for the Ornamental Snake. The guideline also enables the Proponent to undertake an initial assessment to determine whether a significant impact is likely on the species (SEWPaC, 2011a).
- Draft recovery plan for the Queensland Brigalow Belt Reptiles (Richardson, 2006), which provides which provides priority research and management actions for the species, as well as specifying key threats for Ornamental Snake.
- Fitzroy Natural Resource Management Region Back on Track Actions for Biodiversity (DERM, 2010).

### *Survey effort*

Seasonal fauna surveys were undertaken over 22 days and carried out in consideration of relevant Commonwealth and Queensland surveys guidelines. Survey methods and effort included, but was not limited to:

- four systematic trap sites;
- 33 person hours spotlighting;
- 20.5 person hours active searching; and
- 282 diurnal and 104 nocturnal person hours of opportunistic observations.

Spotlighting, active searching, pitfall and funnel traps and incidental/opportunistic observations are methods most relevant for the detection of the Ornamental Snake and these were undertaken in preferred habitat in the Project area. However, the duration of active searching and spotlighting required for the Ornamental Snake under the SEWPaC survey guidelines for Brigalow Belt reptiles was not achieved. The DCCEEW Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles require 1.5 person hours diurnally and nocturnally per hectare over at least three days and nights (SEWPaC 2011a). This equates to more than 148 hours of active

searching and another 148 hours of spotlighting, which would require several weeks of survey in preferred habitat in the Project area.

Despite not meeting the SEWPaC survey guidelines, the Ornamental Snake was confirmed within the Project site during the surveys with the survey effort applied to the Project area.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area are provided in the Terrestrial Ecology Assessment (Appendix F).

### *Survey outcomes and habitat assessments*

Two individuals of Ornamental Snake were detected during spotlighting sessions in non-remnant Coolibah with Brigalow woodland (RE 11.3.3) associated with a stream order 1 drainage line in the south-western portion of the Project site during seasonal surveys (Figure 7.10).

Approximately 99.6 ha of Ornamental Snake habitat has been identified within the Project site and ETL study area, including 34.6 ha of marginal foraging habitat in the form of highly degraded gilgai formations (Figure 7.10).

There is no potential habitat for this species within the proposed road realignment or water extraction/release infrastructure area.

### *Importance of the population*

The Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles identify important habitat for this species as being 'habitat where the species has been identified during a survey' (SEWPaC, 2011a). As this species was recorded in habitat within the Project area, the habitat in the Project area is considered to be important habitat in accordance with the Draft Referral Guidelines.

The Draft Referral Guidelines also outline that because Brigalow Belt reptiles can be difficult to detect, important habitat should be considered a surrogate for important populations. Therefore, the population within the Project area should be considered an important population in line with the Draft Referral Guidelines.

### *Impact assessment*

Of the better quality habitat, 34.9 ha is proposed to be cleared for the Project. No clearing of marginal habitat is proposed.

Indirect impacts to Ornamental Snake are considered unlikely. Indirect impacts related to noise and vibration, dust, lighting, vehicle strike, erosion and sedimentation will be temporary, and reasonably simply managed and therefore minimal. Due to the already fragmented nature of the patches of this habitat in the landscape, edge effects and fragmentation are not expected to be significant and remaining areas of habitat in the study area are not proposed to be impacted by changes in surface water or flooding regimes.

There will be no facilitated impacts as a result of the Project.

Incremental impacts to Ornamental Snake habitat are likely as a result of mine Projects in the region, for which authorisation to clear vegetation and habitat has been granted. These Projects are approved with conditions and in accordance with the EO Act and EPBC Act, where significant impacts are likely, offsets will form part of those conditions. Similarly, where significant impacts are proposed as part of this Project, offsets will be provided. Therefore, in line with the offset legislation, the Project will provide adequate compensation for significant residual impacts to the Ornamental Snake and should not contribute significantly to cumulative impacts.

**Avoidance, mitigation and management**

Impacts to some areas of Ornamental Snake habitat cannot be avoided due to the location of the coal seams. However, impacts to habitat along the ETL study area will be avoided where possible as part of the detailed design and siting of the proposed ETL.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Ornamental Snake habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a ‘Permit to Disturb’ procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

**Rehabilitation requirements**

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank. Revegetation will be also undertaken where required across the mine site.

**Significant impact assessment**

Table 7.18 provides an assessment of the significance of impacts to the Ornamental Snake against the Commonwealth Significant Impact Guidelines.

*Table 7.18: Assessment of significance of impacts for the Ornamental Snake*

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
<ul style="list-style-type: none"> <li>• lead to a long-term decrease in the size of an important population of a species</li> </ul>	The population of Ornamental Snake in the Project area is considered to be an important population. The project will involve clearing of approximately 34.9 ha of habitat. Therefore, the Project may lead to a decrease in the size of an important population.
<ul style="list-style-type: none"> <li>• reduce the area of occupancy of an important population</li> </ul>	The Project will result in removal of a total of 34.9 ha of habitat for an important population. However, potential gilgai habitat is widespread in the region, including in the vicinity of Banana Creek within the additional investigation area, and there are a number of records south of the Project area, in the vicinity of Banana and Moura (CSIRO, 2019). Therefore, removal of the habitat in the Project area is unlikely to reduce the area of occupancy of this species.



Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>fragment an existing important population into two or more populations</li> </ul>	<p>The population of Ornamental Snake that uses the Project area is considered to be an important population. It is proposed that all patches of habitat within the Project site will be cleared for the Project, therefore, fragmentation of these habitat patches will not occur. However, fragmentation of the patch in the north of the ETL study area is likely as a result of clearing for a 20 m wide ETL easement. However, this is unlikely to significantly impact this habitat given the already highly fragmented nature of this patch. Furthermore, this species is able and known to move across cleared paddocks during foraging and dispersal activities.</p> <p>Additionally, aerial photographs indicate large patches of potential gilgai habitat is present to the north, north-east, east and south-east within 5 km of the Project area. The Project does not sever connectivity between habitats in those surrounding areas, e.g. between the Dawson River or Banana Creeks and those gilgai habitats.</p>
<ul style="list-style-type: none"> <li>adversely affect habitat critical to the survival of a species</li> </ul>	<p>Habitat critical to the survival of the species is not defined in the guidelines for this species. Habitat in which the Ornamental Snake was observed does not align with important habitats defined in the Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles or the primary vegetation types, microhabitats or refuge habitats described in the DCCEE SPRAT Profile for the species (DCCEE 2023; SEWPaC, 2011a). Therefore, these habitats along creek lines are not considered to be critical to the survival of the species.</p> <p>The habitat within the Project site and ETL study area is considered unlikely to represent habitat critical to the survival of the species in terms of the definition within the Significant Impact Guidelines. The habitat is used for foraging and potentially breeding for the local population of the species but the habitat is unlikely to be necessary for foraging or breeding for the species as a whole. The habitat is considered unlikely to be necessary for the long-term maintenance of the species, maintaining genetic diversity or recovery of the species.</p>
<ul style="list-style-type: none"> <li>disrupt the breeding cycle of an important population</li> </ul>	<p>The population of Ornamental Snake that uses the Project area is considered to be an important population. Standard industry recognised measures will be employed during the vegetation clearing stages of the Project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland Nature Conservation (Animals) Regulation 2020. This will reduce the risk and extent of disruption to the breeding cycle of Ornamental Snake that occur in the Project area.</p>
<ul style="list-style-type: none"> <li>modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</li> </ul>	<p>Approximately 34.9 ha of Ornamental Snake wetland and gilgai habitat will be impacted by the Project. Although gilgai habitat will remain in the local area, the clearing of habitat has the potential to cause the species to decline in the local area.</p> <p>Indirect impacts associated with the Project will be managed to the extent that they are unlikely to degrade retained habitat within the Project area to the extent this species is likely to decline.</p>
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</li> </ul>	<p>The Project area is located within a modified rural landscape where introduced plants and feral animals are already present. Invasive species and feral animals such as Buffel Grass, Green Panic, Feral Pigs and Wild Dogs have been identified as part of field surveys in the study area. These invasive species already pose a threat to Ornamental Snake within the Project area and in the surrounding landscape, through predation and degradation of habitat, and the Project is unlikely to increase this threat. Similarly, the Project is unlikely to introduce new invasive species that are not already present and established in the Project area as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.</p>

Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>introduce disease that may cause the species to decline, or</li> </ul>	There are few diseases and viruses known to affect snakes in Australia and these are predominantly related to Pythons. The diseases are often (but not always) related to captive snakes, have been known to be introduced by exotic species and usually spread by other affected snakes. It is considered unlikely that the Project will introduce a disease that may cause the Ornamental Snake to decline.
<ul style="list-style-type: none"> <li>interfere substantially with the recovery of the species</li> </ul>	Although the Project will result in the removal of potential and known habitat for the species, the Proponent will implement mitigation strategies to assist in minimising impacts to the species. As such, the Project is considered unlikely to interfere substantially with the recovery of the species as a whole.
<b>Conclusion</b>	The area of habitat proposed to be cleared and the importance of the habitat present indicate the Project is likely to have a significant residual impact on the Ornamental Snake.

#### 7.10.1.5 Squatter Pigeon (Southern)

##### *Description*

The Squatter Pigeon (Southern) is listed as vulnerable under the EPBC Act and Queensland NC Act. This species is known to inhabit tropical dry, open sclerophyll woodlands and occasionally open savannah. It appears to favour sandy soil dissected with low gravelly ridges and is less common on heavy soils with dense grass cover. It is nearly always found in close association with permanent water (Higgins and Davies, 1996). This species is also often recorded from areas that do not support remnant vegetation, however, in these areas, it seems to be associated with clear, disturbed sites such as tracks and stockyards (DCCEEW, 2023d; S. Marston, Pers. obs.). These habitat areas are likely to provide breeding, foraging and dispersal habitat.

The SPRAT profile emphasises the importance of woodland trees, which provide protection from predatory birds. Where scattered trees still occur, and the distance of cleared land between remnant trees or patches of habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (DCCEEW, 2023d).

##### *Current known threats*

The main threats to the Squatter Pigeon (Southern) are as follows:

- loss of habitat due to clearing for agricultural or industrial purposes;
- degradation of habitat, trampling of nests, by grazing herbivores (i.e. sheep, cattle, rabbits);
- predation by feral cats and foxes;
- degradation of habitat through infestation by Buffel Grass and other improved pasture species and weeds; and
- thickening of understory vegetation (DCCEEW 2023d).

##### *Management plans*

The following plans and advice are in place for the Squatter Pigeon (Southern), which have been considered in preparing this assessment:

- **Conservation Advice:** Approved Conservation Advice has been prepared for the Squatter Pigeon, which nominates conservation and management actions for the species. Conservation actions include survey and monitoring priorities, as well as research priorities (TSSC, 2015).
- **Threat Abatement Plan:** Threat abatement plans are in place for the Squatter Pigeon for the threat of feral cats, rabbits and the European Red Fox (DEWHA, 2008a; DotE, 2015b; DoEE, 2016).
- **Recovery Plan:** A recovery plan has not been prepared for the Squatter Pigeon, and the DCCEEW SPRAT Profile explains that one is not required as the Approved Conservation Advice provides sufficient direction to implement priority actions and mitigate against key threats (DCCEEW, 2023d).
- **Referral Guidelines:** The Squatter Pigeon is addressed in the Survey Guidelines for Australia's Threatened Birds EPBC Act Survey Guidelines 6.2 (DEWHA, 2010). No specific referral guidelines are available for the Squatter Pigeon (Southern).

### *Survey effort*

Seasonal fauna surveys were undertaken over 22 days and carried out in consideration of relevant Commonwealth and Queensland surveys guidelines. Survey methods and effort included, but was not limited to:

- 20.5 person hours active searching;
- 37 person hours bird surveying; and
- 282 diurnal and 104 nocturnal person hours of opportunistic observations.

Bird survey, active searching and opportunistic methods are most relevant for detecting the Squatter Pigeon (Southern) and these methods were undertaken in preferred habitat in the Project area. The survey generally complies with Squatter Pigeon survey guidelines, although flushing surveys are recommended by the DCCEEW, and these were not undertaken. Previous experience in this area has shown that this technique is often not required as the species is typically recorded incidentally during surveys. The survey methods that were employed resulted in detection of this species at multiple locations within the study area and therefore flushing surveys were not considered necessary.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area provided in the Terrestrial Ecology Assessment (Appendix F).

### *Survey outcomes and habitat assessments*

This species was recorded at a number of locations in the ETL study area, on the edge of the Project site and in the additional investigation area during the seasonal surveys. Suitable habitat for the Squatter Pigeon (Southern) has been identified in the Project site and in the water release/extraction infrastructure area (Figure 7.12).

Habitat mapping for the Squatter Pigeon (Southern) (Figure 7.12) within the study area has been undertaken in consideration of the SPRAT profile for the species and most recent advice from the DCCEEW. Squatter Pigeon (Southern) habitat is categorised as:

- foraging habitat—grassy woodlands dominated by Eucalyptus, Corymbia, Acacia or Callitris tree species, on sandy or gravelly soils (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) within 3 km of a waterbody; and
- breeding habitat—foraging habitat within 1 km of a waterbody.

Waterbodies that are suitable for the Squatter Pigeon (Southern) are described in the SPRAT profile for the species as 'permanent or seasonal rivers, creeks, lakes, ponds and waterholes, and artificial dams' (DCCEEW, 2023d). Given this definition, first and second order watercourses or drainage channels are generally

not considered to be suitable for this species because of their highly ephemeral nature and tendency to drain quickly and would not include cattle troughs or plastic lined dams.

Suitable habitat in the Project site and water release/extraction infrastructure area consists of the polygons of REs 11.3.25, 11.5.9, 11.5.15, 11.3.3 and 11.3.3a. This woodland vegetation supports a grassy ground layer and is associated with sandy soils. There are two constructed dams to the north and east that are not separated from this vegetation by more than 100 m of cleared land.

Approximately 84.8 ha of habitat suitable for the Squatter Pigeon (Southern) has been mapped within the Project site and water release/extraction infrastructure area, including 83.3 ha of breeding habitat (Figure 7.12).

### *Importance of the population*

The population of Squatter Pigeon (Southern) that uses the study area is considered unlikely to be an important population for the following reasons:

- key source populations either for breeding or dispersal
  - This species is regularly recorded in the central Queensland region and remains common north of the Carnarvon Ranges. All sub-populations of this species occurring south of the Carnarvon Ranges in central Queensland are considered to be important sub-populations (DCCEEW, 2023d). The habitat within the study area remains reasonably common throughout the region and habitat present is considered unlikely to be of particular significance for breeding or dispersal.
- populations that are necessary for maintaining genetic diversity
  - The population of the Squatter Pigeon (Southern) within the region is considered unlikely to be important in maintaining genetic diversity within the species. The inherent mobility of a bird species is likely to increase genetic exchange between individuals in comparison to less mobile species whose access to potential mates may be limited. Because of the relatively high rates of genetic exchange in more mobile species, it is less likely that any single population represents an important population for maintaining genetic diversity. The species is noted as being likely to comprise a single contiguous breeding population (DCCEEW, 2023d). It is therefore considered unlikely that the population in the study area, would be particularly important in maintaining genetic diversity of the species.
- populations that are near the limit of the species range.
  - The range of the Squatter Pigeon (Southern) extends north to the Burdekin region (approximately 550 km north of the study area). The species once occurred in southern New South Wales, although it has not been recorded in New South Wales for some time (DCCEEW, 2023d). The current extent of the Squatter Pigeon ranges to the Border Rivers region of northern New South Wales. The study area is well within the known distribution of this species.

### *Impact assessment*

Approximately 21.9 ha of habitat considered both breeding and foraging habitat for the Squatter Pigeon (Southern) is proposed to be cleared for the Project.

Indirect impacts to the Squatter Pigeon (Southern) are considered unlikely. Indirect impacts related to noise and vibration, dust, lighting, vehicle strike, erosion and sedimentation will be temporary, and able to be managed and therefore minimal. There will be minimal impacts to retained habitat in the Project site and due to the open structure of the community in the south-west of the Project site, edge effects and fragmentation are not expected to be significant. Remaining areas of habitat in the study area are not proposed to be impacted by changes in surface water or flooding regimes.

There will be no facilitated impacts as a result of the Project.

Incremental impacts to Squatter Pigeon (Southern) habitat are likely as a result of mine projects in the region, for which authorisation to clear vegetation and habitat has been granted. These projects are approved with



conditions and in accordance with the EO Act and EPBC Act, where significant impacts are likely, offsets will form part of those conditions. Where impacts are unlikely to be significant, the contribution to the cumulative impact is also considered unlikely to be significant.

#### *Avoidance, mitigation and management*

Impacts to some areas of Squatter Pigeon (Southern) habitat cannot be avoided due to the location of the coal seams, however, impacts to Squatter Pigeon (Southern) habitat along the Dawson River will be minimised where possible as part of the detailed design and siting of the proposed water release/extraction infrastructure. In this area the infrastructure will traverse the narrowest section of riparian vegetation where possible and disturbance will be selective and limited to the understory and ground layer to minimise overall disturbance to the riparian community.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Squatter Pigeon (Southern) habitat to minimise harm to individuals and protect habitat to be retained:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

#### *Rehabilitation requirements*

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank. Revegetation will be also undertaken where required across the mine site.

#### *Significant impact assessment*

Table 7.19 provides an assessment of the Significance of impacts to the Squatter Pigeon (Southern) against the Commonwealth Significant Impact Guidelines.

Table 7.19: Assessment of significance of impacts for the Squatter Pigeon (Southern)

Significance criteria	Assessment of significance
<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p>	
<ul style="list-style-type: none"> <li>lead to a long-term decrease in the size of an important population of a species</li> </ul>	<p>The population of Squatter Pigeon (Southern) that occurs within the Project area is not considered to be an important population. The clearing of 21.9 ha of habitat is unlikely to decrease the size of the population present given the extent of similar habitat available in the region.</p>
<ul style="list-style-type: none"> <li>reduce the area of occupancy of an important population</li> </ul>	<p>The population of Squatter Pigeon(Southern) that occurs within the Project area is not considered to be an important population. The vegetation within the Project area is commonly found throughout the surrounding region and is not considered to be unique or particularly significant for the Squatter Pigeon (Southern). The Squatter Pigeon (Southern) is also known to commonly occur in disturbed habitats. Therefore, due to the availability of similar habitat within the broader region and the mobility of this avian species, the Project is considered unlikely to affect the Squatter Pigeon’s area of occupancy.</p>
<ul style="list-style-type: none"> <li>fragment an existing important population into two or more populations</li> </ul>	<p>The population of Squatter Pigeon (Southern) that occurs within the Project area is not considered to be an important population. The habitats proposed to be cleared are already fragmented and isolated from other vegetated habitats and the proposed clearing will remove the entirety of each patch rather than fragment them further. The Squatter Pigeon (Southern) is a highly mobile species and is known to disperse across cleared and degraded landscapes between preferred habitat areas. The removal of these patches of habitat is considered unlikely to present a significant barrier to this species from moving throughout the landscape. Connectivity of habitat will not be affected by the Project and will remain along the Dawson River and Banana Creek. Therefore, the Project is unlikely to fragment the population of Squatter Pigeon (Southern) occurring in the local area into two or more populations.</p>
<ul style="list-style-type: none"> <li>adversely affect habitat critical to the survival of a species</li> </ul>	<p>Squatter Pigeon (Southern) habitat is relatively broad by definition. Therefore, very few areas, including the habitats in the Project area, would be described as habitat critical to the survival of the species.</p> <p>The potential habitat that is to be disturbed within the Project site and water release/extraction infrastructure area is not regarded as particularly significant or indicative of critical habitat due to its relatively small and isolated nature. It is considered unlikely to be necessary for foraging, breeding, roosting or dispersal, the long-term maintenance of the species, maintaining genetic diversity or recovery of the species.</p> <p>Given the mobility of avian species the Project is considered unlikely to affect habitat critical to the survival of the species.</p>
<ul style="list-style-type: none"> <li>disrupt the breeding cycle of an important population</li> </ul>	<p>The population of Squatter Pigeon (Southern) that occurs within the Project area is not considered to be an important population. It is possible the Squatter Pigeon (Southern) breeds within the broader study area. Standard industry recognised measures will be employed during the vegetation clearing stages of the Project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland NC Act. This will reduce the risk and extent of disruption to the breeding cycle of Squatter Pigeons (Southern) that occur in the Project area.</p>

Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</li> </ul>	<p>Sub-populations in this region have not been identified as being of particular importance for the long-term survival or recovery of this species. The proposed impacts to 68.3 ha of habitat for the Squatter Pigeon (Southern) will not remove habitats, isolate habitats or degrade remaining habitats to the extent that the species is likely to decline. This is because the habitat in the Project area is not considered to be critical for this species and expansive areas of similar habitat occur throughout the Brigalow Belt region.</p> <p>Indirect impacts associated with the Project, such as noise, dust, light, weeds and pest animals will be managed to the extent that they are unlikely to degrade retained habitat to the extent this species is likely to decline.</p> <p>Changes to the flooding regime are predicted to be minor and are unlikely to affect floodplain communities and therefore unlikely to affect availability of Squatter Pigeon (Southern) habitat in this area.</p> <p>Potential drawdown outside the Project area would be limited and groundwater dependence of riparian vegetation along the Dawson River and Banana Creek, is unlikely. Therefore, the Project is not predicted to give rise to impacts on surface water or groundwater that would impact Squatter Pigeon (Southern) habitat outside the Project area.</p>
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</li> </ul>	<p>The study area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive and predatory species, including feral animals such as the Feral Cat and Wild Dog have been identified as part of recent field surveys in the study area. Other species such as Foxes are likely to occur in the broader landscape and the study area is accessible to such species. These predatory species already pose a risk to the Squatter Pigeon (Southern) in the potential habitat areas present and the Project is unlikely to increase this threat. Similarly, the Project is unlikely to introduce new invasive or predatory species that are not already present and established in the study area as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.</p>
<ul style="list-style-type: none"> <li>introduce disease that may cause the species to decline, or</li> </ul>	<p>Disease is not a known threat to this species. Therefore, the Project is unlikely to introduce any disease that may cause the Squatter Pigeon (Southern) to decline.</p>
<ul style="list-style-type: none"> <li>interfere substantially with the recovery of the species</li> </ul>	<p>This species is noted as 'remaining common north of the Carnarvon Ranges in central Queensland' (DCCEEW, 2023d). There is no recovery plan for this species. The Squatter Pigeon (Southern) is known to occur in disturbed areas and potential for this species to occupy adjacent areas in the landscape will remain during and after the proposed Project. The Project will not remove habitat critical to the survival of the species and the population is unlikely to be important. The proposed clearing is relatively small in relation to the extent of habitat that persists within the region. Therefore, it is considered unlikely the Project will interfere substantially with the recovery of the species.</p>
<p><b>Conclusion</b></p>	<p>The Project is considered unlikely to result in a significant residual impact to the Squatter Pigeon (Southern) as the species remains common in its northern distribution and the Project area is unlikely to support an important population or critical habitat for the species.</p>

### 7.10.1.6 Australian Painted Snipe

#### *Description*

The Australian Painted Snipe (*Rostratula australis*) is currently listed as endangered under the EPBC Act and the NC Act. However, this species was listed as vulnerable under the EPBC Act and NC Act at the time of the controlled action decision.

This secretive, cryptic, crepuscular (active at dawn, dusk and during the night) species occurs in terrestrial shallow wetlands, both ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, salt-marsh, dams, rice crops, sewage farms and bore drains with rank emergent tussocks of grass, sedges, rushes or reeds or samphire, and often with scattered clumps of Lignum, Canegrass or sometimes Tea Trees. This species has been known to use wetland areas lined with trees, or that have some scattered, fallen or washed-up timber (DCCEEW 2023j).

Wetland habitat suitable for breeding is noted as being critical for the Australian Painted Snipe in the listing advice for the species. Breeding habitat is described in the advice as:

*...continuous reed beds, stand of reed-like vegetation, rice fields and areas with no surrounding low cover... Nests are made among tall rank tussocks, frequently on small, muddy islands or mounds surrounded by shallow fresh water, sometimes on shores of swamps or on banks of channels. Nesting typically occurs in ephemeral wetlands that are drying out after an influx of water, provided they have complex shorelines and a combination of very shallow water, exposed mud and dense low cover (TSSC, 2013a).*

The SPRAT profile for the species also recognises dense low cover and sometimes some tall dense cover is also present in breeding habitat (DCCEEW 2023j).

#### *Current known threats*

The primary threat to the Australian Painted Snipe is loss and degradation of wetland habitats, through:

- alteration of drainage, reduced flooding and the diversion of water for irrigation and reservoirs;
- changes in vegetation assemblages from cropping and possibly altered fire regimes; and
- grazing causing trampling and altered nutrient levels (TSSC, 2013c).

Potential future threats include:

- changes in hydrological regimes due to climate change;
- predation by feral species; and
- invasion by exotic plants (TSSC, 2013c).

#### *Management plans*

The following plans and advice are in place for the Australian Painted Snipe, which have been considered in preparing this assessment:

- Conservation Advice: Approved Conservation Advice has been prepared for the Australian Painted Snipe, which provides priority research and management actions for the species, as well as specifying key threats (TSSC, 2013c).
- Recovery Plan: There is currently no Commonwealth recovery plan in place for this species. However, The Action Plan for Australian Birds 2000 provides a brief recovery outline for this species (Garnett and Crowley, 2000).



- Information sheet: An information sheet has been prepared for this species that provides details about the habitat of this species, why it is threatened and implications of the EPBC Act (DEH, 2003).

### *Survey effort*

Seasonal fauna surveys were undertaken over 22 days and carried out in consideration of relevant Commonwealth and Queensland surveys guidelines. Survey methods and effort included, but was not limited to:

- four systematic trap sites;
- 33 person hours spotlighting;
- 16 infrared cameras nights;
- 20.5 person hours active searching;
- 37 person hours bird surveying; and
- 282 diurnal and 104 nocturnal person hours of opportunistic observations.

Spotlighting, infrared cameras, active searching, bird survey and incidental/opportunistic observations are methods most relevant for the detection of the Australian Painted Snipe and these were undertaken in preferred habitat in the Project area. The survey effort for the Project generally complied with survey guidelines. However, this is a very cryptic bird that is known to inconsistently use habitats and there is no guarantee that it would be recorded even during favourable conditions.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area provided in the Terrestrial Ecology Assessment (Appendix F).

### *Survey outcomes and habitat assessments*

The Australian Painted Snipe was not recorded in the study area during the seasonal surveys, however, vegetated sections of wetlands and broad drainage lines in the west and south-west of the study area that support Lignum, provide some areas of suitable habitat for this species, and it is considered the species has a moderate likelihood of occurrence. The Project area, it is unlikely to support an important population.

The gilgai areas in the Project site appear to have been blade ploughed in the past and support a low abundance of sedges indicating that they do not hold water for prolonged periods. Nonetheless, these gilgai are likely to provide some wetland features and this species is known to use heavily disturbed areas that exhibit wetland characteristics, including cleared gilgai. Although these cleared gilgai provide seasonal foraging habitat for this species this species is likely to use these disturbed habitats opportunistically during the wet season when gilgai are holding water. Cleared gilgai generally lack canopy cover that forms part of the breeding habitat requirements for this species (DCCEEW 2023j). Therefore, cleared gilgai habitat is considered to comprise marginal foraging habitat for this species in the study area.

Similarly, gilgai and wetland habitats in the additional investigation area may provide foraging habitat for this species (Figure 7.13).

Two broad habitat types are considered to occur in the study area for the Australian Painted Snipe and differ in their naturalness and presence of fringing vegetation that provides cover for this species:

- wetland and drainage lines with fringing vegetation
- cleared gilgai that forms marginal habitat for this species.

Approximately 86.2 ha of potential wetland and drainage line habitat for the Australian Painted Snipe has been mapped within the Project site and ETL study area as well as an additional 84.4 ha of marginal habitat in the form of cleared gilgai habitat (Figure 7.13).

### *Impact assessment*

Approximately 1 ha of wetland and drainage line habitat is proposed to be cleared for the Project as well as an additional 33.9 ha of marginal gilgai habitat (Figure 7.13).

Indirect impacts to Australian Painted Snipe are considered unlikely. Indirect impacts related to noise and vibration, dust, lighting, vehicle strike, erosion and sedimentation will be temporary, and able to be managed and therefore minimal. Due to the already fragmented nature of the patches of this habitat in the landscape, edge effects and fragmentation are not expected to be significant and remaining areas of habitat in the study area are not proposed to be impacted by changes in surface water or flooding regimes.

There will be no facilitated impacts as a result of the Project.

There is no publicly available information about impacts to this species as a result of other projects in the region. However, there is potential for incremental impacts to Australian Painted Snipe habitat as a result of mine projects in the region, for which authorisation to clear vegetation and habitat has been granted. These projects are approved with conditions and in accordance with the EO Act and EPBC Act, where significant impacts are likely, offsets will form part of those conditions. Where impacts are unlikely to be significant, the contribution to the cumulative impact is also unlikely to be significant.

### *Avoidance, mitigation and management*

Impacts to some areas of Australian Painted Snipe habitat cannot be avoided due to the location of the coal seams, however, impacts to habitat along the ETL study area will be avoided where possible as part of the detailed design and siting of the proposed ETL.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Australian Painted Snipe habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

### *Rehabilitation requirements*

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank.

Revegetation will be also undertaken where required across the mine site.

### *Significant impact assessment*

Table 7.20 provides an assessment of the significance of impacts to the Australian Painted Snipe against the Commonwealth Significant Impact Guidelines.

Table 7.20: Assessment of significance of impacts for the Australian Painted Snipe

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
<ul style="list-style-type: none"> <li>lead to a long-term decrease in the size of an important population of a species</li> </ul>	<p>The Project area is unlikely to support an important population, the Project will involve clearing approximately 1 ha of potentially suitable habitat and another 33.9 ha of marginal habitat in the Project site and ETL study area. However, this species was not recorded in the study area during surveys and the potential habitats present are ephemeral. The species is considered in Australia to be a single contiguous breeding population (Garnett <i>et al.</i>, 2011) and is often a solitary breeder. In addition, the species is thought to possibly be migratory or dispersive. Therefore, the presence of this species, should it occur in the study area, is unlikely to be permanent. Considering this, the Project is considered unlikely to decrease the size of a population of this species.</p>
<ul style="list-style-type: none"> <li>reduce the area of occupancy of an important species</li> </ul>	<p>The Project is unlikely to support an important population. Removal of potential habitats in the Project site and ETL study area is unlikely to affect this species' use of the area given floodplain habitats are present elsewhere in the region in association with the Dawson River and Banana Creek. Therefore, the area of occupancy of this species should not be impacted by the Project.</p>
<ul style="list-style-type: none"> <li>fragment an existing important population into two or more populations</li> </ul>	<p>The Project area is unlikely to support an important population. The Australian Painted Snipe is thought to be migratory or dispersive and is widely distributed across the majority of eastern Australia. Therefore, any population of Australian Painted Snipe that may use suitable habitat in the study area is unlikely to be fragmented into two or more populations. The presence of a population in the Project area is likely to be periodical in response to seasonal conditions. The ability of this species to move between remaining habitats will not be compromised as a result of the Project.</p>
<ul style="list-style-type: none"> <li>adversely affect habitat critical to the survival of a species</li> </ul>	<p>Wetland habitat suitable for breeding is noted as being critical for the Australian Painted Snipe in the listing advice for the species (TSSC, 2013a). The potential habitat proposed to be cleared is not regarded as particularly significant or indicative of habitat critical to the survival of the species, as the habitat consists of shallow water at times, it does not provide continuous reed beds, muddy islands or mounds and shorelines or banks are limited. It is considered unlikely to be necessary for foraging, breeding, roosting or dispersal, the long-term maintenance of the species, maintaining genetic diversity or recovery of the species.</p>
<ul style="list-style-type: none"> <li>disrupt the breeding cycle of an important population</li> </ul>	<p>The Project area is unlikely to support an important population. It is not known if the species breeds in the Project site or ETL study area, although potential habitat present does not exhibit particularly suitable characteristics for breeding. Nonetheless, the Project will employ standard industry recognised measures during the vegetation clearing stages of the Project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland Nature Conservation (Wildlife Management) Regulation 2020. This will reduce the risk and extent of disruption to the breeding cycle of Australian Painted Snipe that may be present.</p>

Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</li> </ul>	<p>Approximately 1 ha of potentially suitable Australian Painted Snipe habitat will be impacted by the Project as well as an additional 33.9 ha of marginal habitat. However, this is unlikely to cause the species to decline as it is unlikely to be permanently used.</p> <p>Indirect impacts associated with the Project, such as noise, dust, light, weeds and pest animals will be managed to the extent that they are unlikely to degrade retained habitat within the study area to the extent this species is likely to decline.</p> <p>Changes to the flooding regime are predicted to be minor and are unlikely to affect floodplain communities and therefore unlikely to affect availability of Australian Painted Snipe habitat in this area.</p> <p>Potential drawdown outside the Project area would be limited and groundwater dependence of riparian vegetation along the Dawson River and Banana Creek, is unlikely. Therefore, the Project is not predicted to give rise to impacts on surface water or groundwater that would impact Australian Painted Snipe habitat outside the Project area.</p>
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</li> </ul>	<p>The Project area is located within a modified rural landscape where introduced plants and feral animals are already present. Invasive species and feral animals such as Buffel Grass, Green Panic, Feral Pigs and Wild Dogs have been identified as part of field surveys in the study area. These invasive species and likely others, such as the Red Fox, already pose a threat to the Australian Painted Snipe and its potential habitat within the Project area and in the surrounding landscape and the Project is unlikely to increase this threat. Similarly, the Project is unlikely to introduce new invasive species that are not already present and established in the study area as controls will be put in place as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.</p>
<ul style="list-style-type: none"> <li>introduce disease that may cause the species to decline, or</li> </ul>	<p>Disease is not a known threat to this species. Therefore, the Project is considered unlikely to introduce disease that may cause the Australian Painted Snipe to decline.</p>
<ul style="list-style-type: none"> <li>interfere substantially with the recovery of the species</li> </ul>	<p>There is currently no Commonwealth recovery plan in place for this species. The Project area is unlikely to support a permanent population of the Australian Painted Snipe and the area proposed to be impacted is unlikely to provide suitable breeding habitat for this species. Therefore, clearing of 23.8 ha of potentially suitable habitat and an additional 68.3 ha of marginal habitat, is considered unlikely to interfere with the recovery of the species.</p>
<p><b>Conclusion</b></p>	<p>The Project is unlikely to significantly impact the Australian Painted Snipe as it is unlikely to breed in the Project site or ETL study area or use the Project area permanently.</p>

### 7.10.1.7 Koala

#### Description

The Koala is widespread in sclerophyll forest and woodland on foothills and plains on both sides of the Great Dividing Range from about Chillagoe, Queensland to Mt Lofty Ranges in South Australia (Menkhorst and Knight, 2011).

Any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees provides potential Koala habitat. Koalas are known to occur in modified or regenerating native vegetation communities and are not restricted to remnant vegetation (DAWE 2020b). The EPBC Act referral guidelines for



the vulnerable Koala defines Koala food trees as those of the following genus: Angophora, Corymbia, Eucalyptus, Lophostemon and Melaleuca. The guideline also notes that 'primary' and 'secondary' food trees may be referred to in other state or Commonwealth guidelines or policies, however, all are considered to be food trees for the purposes of the EPBC Act referral guidelines for the vulnerable Koala (DotE, 2014). The abundance of primary food trees is thought to influence the density of Koalas in a population (Phillips and Callaghan, 2011).

### *Importance of the population*

The population of Koala that may use the Project area is considered unlikely to be an important population for the following reasons:

- **Key source populations either for breeding or dispersal:** The Project area is considered likely to support only a low density of Koalas. The suitable open woodland habitat within the Project site is fragmented and more widespread throughout the broader region. Therefore, dispersal and breeding is likely to occur throughout the larger region rather than in the Project site itself. It is therefore unlikely to support a key source population for breeding or dispersal.
- **Populations that are necessary for maintaining genetic diversity:** Individual Koalas that may use the Project area would likely belong to a larger meta-population of Koalas that would occur within areas of suitable habitat throughout the broader region. Any population of Koalas using the Project area would not necessarily be unique, large, isolated or genetically disjunct from any other Koalas occurring in the region. Therefore, any individuals using the Project area would not be considered necessary for maintaining genetic diversity.
- **Populations that are near the limit of the species range:** The Project area is not at or near the limit of this species' range. The Koala occurs throughout coastal and inland areas of eastern Australia and the Project area is located more or less centrally within the known distribution of this species (DotE, 2014).

### *Current known threats*

Current known threats to the Koala include:

- wide-scale climate change drivers associated with increased frequency and intensity of drought and high temperatures; bushfires; and shrinking climatically suitable habitat areas;
- disease and mortality caused by the Koala Retrovirus and Chlamydia;
- habitat loss and fragmentation mainly through urban development, grazing, agriculture, timber harvesting and mining; and
- predation by the domestic dog and vehicle strikes primarily associated with urban expansion but also present in rural environments (DAWE, 2022).

### *Management plans*

The following plans and advice are in place for the Koala, which have been considered in preparing this assessment:

- **Conservation Advice:** Conservation Advice has been prepared for the Koala, which provides priority research and management actions for the species, as well as specifying key threats (TSSC, 2012).
- **Threat Abatement Plan:** There is no threat abatement plan in place for the Koala.
- **Recovery Plan:** There is currently no recovery plan in place for the Koala, however, the DAWE SPRAT Profile identifies that a Recovery Plan is required (DAWE, 2022b).
- **Information sheet:** A review of Koala habitat assessment criteria and methods (Youngentob *et al.*, 2021) has been prepared for the species, which aims to provide: region-specific habitat descriptions based on

preferred Koala food and habitat trees; information about habitat extent, movement, threats and refugia; review of current methods for on-ground Koala assessment.

- **Referral Guideline:** The EPBC Act Referral Guidelines for the Vulnerable Koala outline important habitat for the Koala, and a habitat assessment tool is provided to assess if the habitat within the impact area is critical to the survival of the species. The guidelines also enable the Proponent to undertake an initial assessment to determine whether a significant impact is likely on the species (DoE, 2014a).

### *Survey effort*

Seasonal fauna surveys were undertaken over 22 days and carried out in consideration of relevant Commonwealth and Queensland surveys guidelines. Survey methods and effort included, but was not limited to:

- 33 person hours spotlighting;
- 18 call playback sessions;
- 16 infrared cameras nights;
- 35 Koala SAT survey sites; and
- 282 diurnal and 104 nocturnal person hours of opportunistic observations.

Spotlighting, call playback, SAT survey sites and opportunistic methods are most relevant for detecting the Koala and these methods were undertaken in preferred habitat in the Project area. The survey generally complies with Koala survey guidelines and this species' scratchings were recorded in the study area along Banana Creek.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area provided in Appendix F, Terrestrial Ecology Assessment.

### *Survey outcomes and habitat assessments*

No evidence of the Koala was detected in the Project area during the seasonal fauna surveys. However, scratches of this species were identified on Queensland Blue Gum along Banana Creek in the additional investigation area during the post-wet season survey in 2020. All remnant REs and some areas of non-remnant regrowth woodlands in the study area are considered to provide habitat for the Koala due to the presence and moderate to abundant cover of Koala food trees. This potential habitat constitutes 111.1 ha within the Project site and another 0.4 ha in the water release/extraction infrastructure area (Figure 7.11). It has been determined that the habitat within the Project site does not constitute critical habitat for the Koala (i.e. a habitat quality score of 4), primarily due to the fragmented nature of this habitat, limited connectivity outside the Dawson River corridor and lack of refuge habitat within the Project site. The Project site is unlikely to provide dispersal opportunities for the Koala outside the Dawson River corridor.

Riparian and alluvial habitat in the additional investigation area, associated with the Dawson River and Banana Creek, is likely to provide refuge habitat and is likely to be critical for the survival of the species. The water release/extraction infrastructure area sits on the edge of this habitat.

### *Impact assessment*

A total of 26.5 ha of potential habitat for the Koala in the Project site is proposed to be cleared for the Project. However, as noted above this habitat is not considered to constitute critical habitat for the Koala and is therefore marginal quality habitat for this species. Impacts to an additional 0.4 ha is required for the water release/extraction infrastructure on the edge of the Dawson River. However, this impact will involve understory vegetation only. No Koala food trees are proposed to be cleared within this area.

The 'EPBC Act referral guidelines for the vulnerable Koala' (DotE, 2014) were consulted in preparing this assessment to assist with determining whether the impact is considered to be significant. It is noted in Section 7 of these guidelines that the higher the score of critical habitat for the Koala the greater risk of significant impact. An example is provided in Section 7, whereby clearing of 100 ha of habitat with a score of 5 (critical habitat) is considered likely to result in a significant impact. In this regard, a similar area of clearing impact with a lower score (not critical) is less likely to be significant for the Koala.

Indirect impacts to Koalas are considered unlikely. Indirect impacts related to noise and vibration, dust, lighting, vehicle strike, erosion and sedimentation will be temporary, and able to be managed and therefore minimal. There will be minimal impacts to retained habitat in the Project site and due to the open structure of the community in the south-west corner of the Project site, edge effects and fragmentation are not expected to be significant. Remaining areas of habitat in the study area are not proposed to be impacted by changes in surface water or flooding regimes.

There will be no facilitated impacts as a result of the Project.

Incremental impacts to Koala habitat are likely as a result of mine Projects in the region, for which authorisation to clear vegetation and habitat has been granted. These Projects are approved with conditions and in accordance with the EO Act and EPBC Act, where significant impacts are likely, offsets will form part of those conditions. Similarly, where significant impacts are proposed as part of this Project, offsets will be provided. Therefore, in line with the offset legislation, the Project will provide adequate compensation for significant residual impacts to the Koala and should not contribute significantly to cumulative impacts.

#### *Avoidance, mitigation and management*

Impacts to Koala habitat within the Project site cannot be avoided due to the location of the coal seams. However, impacts to Koala food trees along the Dawson River will be avoided. Clearing of trees is not required to site the water release/extraction infrastructure in this riparian habitat.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Koala habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

#### *Rehabilitation requirements*

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank. Revegetation will be also undertaken where required across the mine site.

#### *Significant impact assessment*

Table 7.21 provides an assessment of the significance of impacts to the Koala against the Commonwealth Significant Impact Guidelines.

Table 7.21: Assessment of significance of impacts for the Koala

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
<ul style="list-style-type: none"> <li>lead to a long-term decrease in the size of an important population of a species</li> </ul>	<p>The population of Koala that potentially occurs within the Project site is not considered to be an important population. The extent of clearing is unlikely to decrease the size of the population present given the extent of better quality and potential refuge habitat available elsewhere in the region.</p>
<ul style="list-style-type: none"> <li>reduce the area of occupancy of an important population</li> </ul>	<p>The population of Koala that potentially occurs within the Project site is not considered to be an important population. The vegetation within the Project site is commonly found throughout the surrounding region and is not considered to be unique or particularly significant for the Koala.</p> <p>Due to the availability of better quality and refuge habitat associated with the Dawson River and Banana Creek to the west of the Project site, which will facilitate the continued occupancy and dispersal of Koalas in the local region, the Project is considered unlikely to reduce the area of occupancy of this species.</p> <p>Koala food trees are not proposed to be cleared in the Dawson River riparian habitat as part of construction of the water release/extraction infrastructure.</p>
<ul style="list-style-type: none"> <li>fragment an existing important population into two or more populations</li> </ul>	<p>The population of Koalas that potentially occur within the Project site is not considered to be an important population. The habitat areas present within the Project site are generally small patches within a highly fragmented landscape. Connectivity of habitat will not be compromised as a result of the Project to the extent that the local Koala population would become fragmented. This is because dispersal across the Project site to the east from better quality habitat associated with the Dawson River is unlikely due to the lack of habitat east of the Project site, including on Mount Ramsay. Dispersal of this species is most likely within habitats along the Dawson River corridor and less likely out into the smaller and fragmented patches that occur within the largely cleared Project site. Koala food trees will not be impacted in the water release/extraction infrastructure area on the edge of Dawson River riparian habitat.</p>
<ul style="list-style-type: none"> <li>adversely affect habitat critical to the survival of a species</li> </ul>	<p>The potential marginal habitat within the Project site is not considered to be habitat critical to the survival of the Koala primarily due to its fragmented state, distance from other habitat patches and lack of refuge habitat. Habitat along the Dawson River and Banana Creek have been identified as potentially critical habitat due to refuge value, however, Koala food trees within potential refuge habitat along the Dawson River will not be cleared as part of construction of the water release/extraction infrastructure. Impacts will be limited to understory vegetation.</p> <p>Therefore, no critical habitat is proposed to be impacted.</p>
<ul style="list-style-type: none"> <li>disrupt the breeding cycle of an important population</li> </ul>	<p>The population of Koalas that potentially occur within the Project site is not considered to be an important population. Standard industry recognised measures will be employed during the vegetation clearing stages of the Project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland NC Act. This will reduce the risk and extent of disruption to the breeding cycle of Koalas should they occur in the Project site.</p> <p>Further, indirect impacts associated with the Project such as noise and light, will be managed to the extent that they are unlikely to disrupt the breeding cycle of the Koala.</p>



Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</li> </ul>	<p>The Project is considered unlikely to isolate habitats or degrade remaining habitats to the extent that the species is likely to decline. Connectivity of habitats within the landscape will be maintained in the broader region.</p> <p>Indirect impacts associated with the Project such as noise, dust, light, weeds and pest animals will be managed to the extent that they are unlikely to degrade retained habitat within the study area to the extent this species is likely to decline. It is also noted that none of these indirect impacts are recognised as threats to the Koala.</p> <p>Changes to the flooding regime are predicted to be minor and are unlikely to affect floodplain communities and therefore unlikely to affect availability of Koala habitat in this area.</p> <p>Potential drawdown outside the Project area would be limited and groundwater dependence of riparian vegetation along the Dawson River and Banana Creek, is unlikely. Therefore, the Project is not predicted to give rise to impacts on surface water or groundwater that would impact Koala habitat outside the Project area.</p>
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</li> </ul>	<p>The Project area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive and predatory species, including feral animals such as the Feral Cat and Wild Dog have been identified as part of recent field surveys in the study area. Other species such as Foxes are likely to occur in the broader landscape and the study area is accessible to such species. These predatory species already pose a risk to the Koala in the potential habitat areas present and the Project is unlikely to increase this threat. Similarly, the Project is unlikely to introduce new invasive or predatory species that are not already present and established in the Project area as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.</p>
<ul style="list-style-type: none"> <li>introduce disease that may cause the species to decline, or</li> </ul>	<p>Three viruses are known to affect Koalas in the wild, Chlamydia and Koala Retrovirus (KoRV-A and KoRV-B). Studies have shown that 100% of Koalas in the wild have the Retrovirus, and the majority of Queensland and New South Wales populations are infected with Chlamydia (Hanger and Loader, 2009).</p> <p>While a large proportion of the Koala population in any given area may be infected with these diseases, not all show outward signs of the diseases. Chronic stress from habitat loss, disturbance, degradation, heat stress and poor nutrition have been suggested to trigger the development of disease on Koalas (Younentob <i>et al.</i>, 2021). Clearing associated with the Project is not considered to introduce or increase the prevalence of these diseases in the local Koala population. This is because use of the habitat in the Project area is likely to be limited and retention of refuge habitat associated with the Dawson River and connectivity of this riparian corridor provides extensive areas of habitat in the broader region.</p>
<ul style="list-style-type: none"> <li>interfere substantially with the recovery of the species</li> </ul>	<p>The Project will result in clearing of 94.6 ha of Koala habitat. This habitat is not considered to be critical to the survival of the Koala. An additional 0.1 ha of habitat that is likely to provide refuge habitat for this species along the Dawson River will be impacted through understory and ground layer clearing. No Koala food trees will be impacted in this refuge habitat.</p> <p>Further, the Dawson River corridor will continue to facilitate Koala movement opportunities throughout the region as well as providing refuge habitat for this species.</p> <p>Indirect impacts associated with the Project will be managed to the extent they are unlikely to interfere with the recovery this species.</p> <p>Therefore, it is considered unlikely the Project will interfere substantially with the recovery of the Koala.</p>

Significance criteria	Assessment of significance
Conclusion	The clearing of 26.5 ha of habitat that is not considered critical to the survival of the Koala is unlikely to result in a significant residual impact to the Koala.

### 7.10.1.8 Fitzroy River Turtle

#### Description

The Fitzroy River Turtle is a medium to dark brown freshwater turtle with an oval shell, growing up to 25 cm in length with scattered darker spots on the upper shell surface (DoE, 2020). It has a pale yellow or cream underside, dull olive-grey exposed fleshy parts and a distinct narrow white ring around the eye in adults, or a silvery-blue iris in hatchlings (Cogger, 2000; Hamann *et al.*, 2007; DoE, 2020). The Fitzroy River Turtle has relatively long forelimbs with five long claws and large cloacal bursae (Cogger, 2000; Wilson & Swan, 2003).

This species is a benthic omnivore, with a diet consisting of insects, macroinvertebrates (principally larvae and pupae of *Trichoptera* and *Lepidoptera*), crustaceans, gastropods, worms, freshwater sponges, algae and aquatic plants including Ribbonweed (*Vallisneria* sp.) (DEWHA, 2008).

#### Habitat and ecology

The Fitzroy River Turtle is largely sedentary with a relatively small home and movements typically restricted between riffle zones and adjacent pools. The average home range for nine individuals in 2001 was between 417 to 679 m, and typically remaining a distance between 258 to 359 m to a riffle zone (Tucker *et al.*, 2001). However, large-scale movement may potentially occur for the purpose of dispersal, courtship and nesting migrations and repositioning following flood displacement (Tucker *et al.*, 2001). This species does follow movement patterns relating to flow rate (Tucker *et al.*, 2001), in that it:

- moves slightly upstream of riffle zones under moderate flow;
- moves downstream of riffle zones under base flows; and
- has no obvious directional movement patterns under flood conditions.

The Fitzroy River Turtle's preferred habitat is clear flowing watercourses that have (Cogger *et al.*, 1993; Tucker *et al.*, 2001; Limpus *et al.*, 2011):

- rocky, gravelly or sandy substrates;
- large deep pools (between 1 m and 5 m deep) that provide refuge areas and are associated with shallow riffles zones that provide favourable foraging habitat for macroinvertebrates;
- instream features such as undercut banks, submerged boulders, tree roots and logs, which provide rest and refuge spots;
- instream vegetation (in particular Ribbonweed [*Vallisneria* sp.]) which is a preferred food source and provides favourable foraging habitat for macroinvertebrates; and
- healthy riparian vegetation fringing the waterway including blue gums (*Eucalyptus tereticornis*), river oaks (*Casuarina cunninghamiana*), weeping bottlebrushes (*Callistemon viminalis*) and paperbarks (*Melaleuca linariifolia*) (DEWHA, 2008).

During wet periods, the turtles prefer habitats with moderate flow and 1-2.5 m visibility to assist while foraging in riffles. During dry periods, when the riffle zones dry, the turtles inhabit deeper pools with standing or slow-flowing water.

While flowing waters are thought to be preferred by the species, the Fitzroy River Turtle is also known to inhabit the shallow upstream margins of impoundments and have been recorded within impounded waters, including breeding populations (Limpus, C. [DES] pers. comm. 2020). However, deep water areas (greater than 5 m) typical of impoundments are considered largely unsuitable to the species due to low oxygen levels, little or no light penetration, cold temperatures and low available of favourable foraging habitats (Limpus *et al.*, 2011).

Nesting habitat is typically restricted to areas with alluvial sand/loam banks 1-4 m above water level, deposited after flooding events. Some nesting sites have been found 15 m from the water on flat sandbanks (DEWHA, 2008). Banks that have a relatively steep slope, low density of ground or understorey vegetation and partial shade cover are considered to be preferred based on limited data. Females have an annual reproductive potential of 46 to 59 eggs (29 mm long and 21 mm wide) laid within three clutches which are deposited in nesting chambers 170 mm deep (DEWHA, 2008; Hamann *et al.*, 2007). Nesting occurs in spring (September to November), with hatching occurring between November and March (Limpus *et al.*, 2011). Sexual maturity is reached between 15 and 20 years (Hamann *et al.*, 2007).

### *Distribution and records*

The Fitzroy River Turtle is endemic to the Fitzroy River basin in Queensland and occurs in an estimated total area of less than 10,000 km<sup>2</sup> within the permanent water habitats of the middle and lower reaches of the Fitzroy, Dawson, Mackenzie and Comet Rivers and associated tributaries (DEWHA, 2008; Limpus *et al.*, 2011). Their distribution extends from the Fitzroy Barrage to the upper areas of the Dawson (to at least Theodore Weir), Nogoia and Connors Rivers.

Areas where the species is known to occur include waterways around Boolburra, Gainsford, Glenroy Crossing, Theodore, Baralaba, the Mackenzie River, the Connors River, Duaringa, Marlborough Creek and Gogango (Cogger *et al.*, 1993). Known key breeding spots for the Fitzroy River Turtle include Glenroy and Redbank crossings on the Fitzroy River, Theodore Weir on the Dawson River, Cardowan pump pool on the Connors River and Marlborough Creek (Limpus *et al.*, 2011).

The closest published records of this species in the Atlas of Living Australia are in the Dawson River approximately 70 km downstream near the town of Boolburra, and 45 km upstream to the south near Moura (ALA, 2019) (Figure 7.27). However, the record from Moura is from a skeleton lodged with the museum (Amey, A. [Queensland Museum] pers. comm. 2020), as such it is difficult to ascertain whether there are individuals or a population of this species at Moura Weir, or whether this specimen was washed downstream and recovered from this location.

However, during surveys previously completed within the region for the Baralaba Mine, a Fitzroy River Turtle was recorded at a site on the Dawson River downstream of Neville Hewitt Weir, 20 km downstream of the study area; the exact location of this record is unpublished (BMT WBM, 2011a). There are also unpublished records that indicate two Fitzroy River Turtles have been recorded within the waters of the Neville Hewitt Weir; the exact location of the records is unknown, but the Neville Hewitt Weir impoundment is within the study area (Venz *et al.*, 2002; Limpus *et al.*, 2011). Because freshwater turtles are relatively long-lived (approximately 20 years to maturity), it is difficult to determine if the presence of this species in these locations represents a relictual population persisting in unfavourable conditions, or whether those individuals are part of a healthy breeding population (Venz *et al.*, 2002).

The species has only been recorded in waters of the Dawson River main channel, and not in any of the smaller waterways in the region likely due to lack of suitable habitat. This species occurs within the permanent freshwater riverine reaches, with no known records of occurrences in spring-fed waterholes and streams or small farm dams created outside of the permanent riverine habitats, nor has it been detected in permanent billabongs that parallel the main stream on the floodplains of the lower Fitzroy (Limpus *et al.*, 2011; Limpus, C. [DES] pers. comm. 2020).

### *Current known threats*

The most significant threat to the Fitzroy River Turtle is the predation and trampling of eggs by agricultural stock. Breeding is being undermined because communal nesting sites along riverbanks are now heavily exploited by foxes (*Vulpes vulpes*), pigs (*Sus scrofa*), dingos (*Canis lupus*), cats (*Felis catus*), goannas (*Varanus gouldii*) and water rats (*Hydromys chrysogaster*). With over 90% of nests being lost to predation, the turtle population now consists almost entirely of adults, with no juveniles recruiting into the population (Limpus *et al.*, 2011). Artificial barriers increase this threat as turtles have to move further over land to find suitable habitat which may increase the risk of interactions with feral animals (DoEE, 2017c). Fishing and recreational boats may also cause injury or mortality (Limpus *et al.*, 2011).

Other dominant threats identified include (DEWHA, 2008):

- loss and disturbance of habitat from mining and agriculture (particularly cotton and cattle farming);
- invasive weeds, which may increase the difficulty of access to the preferred nesting sites;
- water salinity, pollution and siltation in rivers and creek habitat, which affects food resources and cloacal respiration;
- damming of rivers, which restricts water flow and may threaten this species by impacts on dietary ecology or cloacal respiration; dams and weirs may also act as a physical barrier which restricts access to feeding and nesting sites; and
- water quality changes such as increased sediment and nutrient load from dam and weir construction works, and increased runoff of pesticides and herbicides from irrigation, which are likely to have detrimental effects on the dietary ecology of this species (Venz *et al.*, 2002).

### *Survey effort*

The survey effort for the Fitzroy River Turtle is described in section 7.3.2. In summary, the Fitzroy River Turtle can be difficult to survey as they rarely enter traps. The highly turbid waters of the Dawson River and tributaries within the study area restricted the use of preferred survey techniques for this species, including snorkelling. The presence of snags precluded the use of seine nets, except for in Banana Creek. The main survey techniques relied upon were:

- spotlighting from boat in the Dawson River and Shirley's Gully (over a 1 km distance) and from the bank in Banana Creek (over a 100 m distance) (19.25 hrs over four days);
- electrofishing from boat—as above this method did not target turtles but turtles were incidentally recorded;
- baited fyke nets (117.5 hrs over three days in the dry season survey and 125 hrs over four days in the post-wet season survey);
- Seine netting (one sweep at site BC2 in Banana Creek during the dry season survey); and
- daytime searching for nests and assessment of potential habitat.

The effectiveness of evening spotlighting was also impacted by the highly turbid water, which is a known limitation of surveying in turbid environments for this species (Limpus, C. [DES] pers. comm., 2020). To compensate, additional effort was employed to assess the suitability of habitat at each site to support the Fitzroy River Turtle (and White-throated Snapping Turtle) and reviewing available data on the occurrences of listed turtle species in the region to inform the likelihood of their occurrence in the study area.

### *Survey outcomes and habitat assessments*

There is no suitable habitat for the Fitzroy River Turtle within the Project area.



The habitat provided within the Dawson River, Dawson River Anabranh, Shirley's Gully and Banana Creek adjacent to and downstream of the Project is characterised by a large, deep weir pool created by the Neville Hewitt Weir downstream of the Project. These reaches are mapped as lacustrine wetland by DES under the Queensland Wetlands Mapping Program (Figure 7.4). The waterways do not provide the preferred / key riverine habitat characteristics for the Fitzroy River Turtle (such as pool and riffle sequences, diversity of substrate and habitat types) in the vicinity of the site, although it is acknowledged that the Fitzroy River Turtle and White-Throated Snapping Turtle can and does occur in the upper reaches of weir pools in the Dawson River (Limpus *et al.*, 2011; Limpus, C. [DES] pers. Comm., 2020). It was therefore considered that the Dawson River and Anabranh, Shirley's Gully and Banana Creek provided potentially suitable habitat for the Fitzroy River Turtle. As the Fitzroy River Turtle was not detected during the field surveys and as there is no key or preferred habitat present (due to the relatively deep water as a result of the Neville Hewitt Weir downstream), the occurrence of the Fitzroy River Turtle in the areas adjacent to the Project is considered likely to be transient rather than permanent.

No ideal banks for nesting (i.e. sandy alluvial banks) were noted at sites on Dawson River, Dawson River Anabranh, Shirley's Gully or Banana Creek, however, potential nesting banks were noted around the Dawson River and Anabranh; Fitzroy River Turtles have been known to nest in well-vegetated earthen banks, which characterised the banks of these waterways.

### *Impact assessment*

There is no suitable habitat for the Fitzroy River Turtle within the disturbance footprint. As such, there will be no direct impacts to this species or its habitat within the Project. The proposed water infrastructure site is within the Neville Hewitt Weir inundation area, which does not provide preferred habitat for this species. The worst-case estimate of the area of potential stream bank to be affected is less than 500 m<sup>2</sup>.

The potential impacts to water quality in the receiving environment of the Dawson River as a result of planned releases are predicted to be minor and not significant in an ecological context, with the exception of localised impacts in the mixing zone. As the proposed release point is not located in an area containing preferred habitat for the Fitzroy River Turtle, it is considered highly unlikely that the controlled releases will impact on this species or its habitat; particularly as it is a mobile species.

The modelled impacts to the hydrology and flooding of the Dawson River as a result of the Project are minor in an ecological context, and they are unlikely to change the nature of the habitat available upstream and downstream of the Neville Hewitt Weir (i.e. weir pool habitat and regulated riverine habitat respectively). Most notably, there will be no significant reductions in flow downstream of the weir and as such, no impacts to the existing Dawson River channel morphology (including the presence of run and riffle habitat) or riparian vegetation are expected. As such, the changes are not likely to result in noticeable impacts to the extent or quality of Fitzroy River Turtle habitat present in the river.

It is not expected that the Project will result in the introduction of any new aquatic pest species to the Dawson River, and as such no indirect impacts to the habitat of the Fitzroy River Turtle are expected as a result of this. Likewise, as there will be no major changes to the habitat present within the Neville Hewitt Weir pool (i.e. no changes to water depths, velocity or water quality), there is no predicted change to the current extent of aquatic weed species within the study area.

No indirect impacts to Fitzroy River Turtle habitat are expected as a result of impacts to groundwater, as the waterways providing Fitzroy River Turtle habitat are not considered to be aquatic (surface-expression) GDEs, no impacts to the riparian vegetation (which is a terrestrial GDE) are expected, and negligible impacts to flows in the river are predicted as a result of groundwater leakage from the Dawson River (Appendix B, Groundwater Modelling and Assessment).

The Project will not result in any other actions that have the potential to impact on Fitzroy River Turtles or their habitats. As such, no facilitated impacts to the Fitzroy River Turtle are predicted.

Potential cumulative impacts to the Fitzroy River Turtle could arise as the result of indirect impacts, e.g. changes to the water quality and hydrology of the Dawson River (including the anabranh) and its tributaries, as a result of the cumulative impacts of the Baralaba South Project along with other Projects in the area.

The cumulative impacts of the Baralaba South Project and the Baralaba North Mine and Dawson Mine on the hydrology of the Dawson River and tributaries have been modelled. In summary, these assessments concluded that there would be negligible cumulative impacts to the Dawson River streamflow (reduction of approximately 0.04% in mean annual flow) (Appendix A, Surface Water Impact Assessment). This minor reduction is not predicted to result in changes to the extent or availability of preferred Fitzroy River Turtle habitat, such as riffles and runs, downstream of the Neville Hewitt Weir.

#### *Avoidance, mitigation and management*

There is no potential Fitzroy River Turtle habitat within the Project footprint; as such, direct impacts have been avoided. The exception is the potential for a very small area (less than 500 m<sup>2</sup>) to be affected by construction of water extraction or discharge infrastructure. The potential impacts of this will be minimised and mitigated by reducing the construction footprint of the water extraction infrastructure as far as practical and limiting disturbance of the bank on which it will be positioned.

The potential indirect impacts to Fitzroy River Turtle habitat as a result of impacts to water quality and hydrology will be minimised and mitigated by developing and implementing the following management and monitoring plans for the site:

- Water Management Plan;
- Erosion and Sediment Control Plan;
- Progressive Rehabilitation and Closure Plan;
- Water Quality Monitoring Program; and
- Receiving Environment Monitoring Program.

The REMP will monitor the impacts of the Project on the environmental values of the receiving environment (including water quality, flows and biological health indicators such as macroinvertebrates), and to provide feedback for continuous improvement of environmental management if required.

#### *Rehabilitation requirements*

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank. Revegetation will be also undertaken where required across the mine site.

#### *Significant impact assessment*

Table 7.22 provides an assessment of the significance of impacts to the Fitzroy River Turtle against the Commonwealth Significant Impact Guidelines.

Table 7.22: Assessment of significance of impacts for the Fitzroy River Turtle

Significant Impact Criteria (DoE, 2013a)	Residual Significant Impact Assessment for the Project
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
<ul style="list-style-type: none"> <li>lead to a long-term decrease in the size of an important population of a species</li> </ul>	<p>An important population of the Fitzroy River Turtle has not been identified within the waters of the Neville Hewitt Weir pool.</p> <p>Regardless, with the appropriate mitigation measures in place, mortality of individual Fitzroy River Turtles is not expected, nor are impacts to breeding (noting that it has not been established that breeding of this species occurs within the study area).</p> <p>Likewise, no significant impacts to water quality or hydrology are predicted downstream of the Neville Hewitt Weir, and as such no impacts to individuals or breeding populations in the reaches downstream of the weir are predicted.</p>
<ul style="list-style-type: none"> <li>reduce the area of occupancy of an important population</li> </ul>	<p>An important population of the Fitzroy River Turtle has not been identified within the waters of the Neville Hewitt Weir pool.</p> <p>Regardless, the Project is not expected to have any direct or indirect impacts to the habitat of Fitzroy River Turtle (either upstream or downstream of the weir); and as such the area of occupancy for this species will not be reduced.</p>
<ul style="list-style-type: none"> <li>fragment an existing important population into two or more populations</li> </ul>	<p>An important population of the Fitzroy River Turtle has not been identified within the waters of the Neville Hewitt Weir pool. Regardless, the Project will not result in the fragmentation of Fitzroy River Turtle habitat or populations.</p>
<ul style="list-style-type: none"> <li>adversely affect habitat critical to the survival of the species</li> </ul>	<p>It has not been established that the waters of the Neville Hewitt Weir pool provide habitat critical to the survival of the species; rather, it is highly likely that they do not. Regardless, the Project will not result in any adverse impacts to Fitzroy River Turtle habitat.</p>
<ul style="list-style-type: none"> <li>disrupt the breeding cycle of an important population</li> </ul>	<p>It has not been established that there is a breeding population of Fitzroy River Turtle in the Neville Hewitt Weir pool.</p> <p>Regardless, the Project will not result in any adverse impacts to Fitzroy River Turtle breeding habitat, or any reductions in water or habitat quality (that could lead to decreased fitness or breeding success).</p>
<ul style="list-style-type: none"> <li>modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</li> </ul>	<p>The Project will not result in any adverse impacts to potential Fitzroy River Turtle habitat, either as a result of direct impacts or indirect impacts (e.g. to water quality or flows).</p>
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</li> </ul>	<p>The Project will not result in the establishment of an invasive species within the Fitzroy River Turtle's habitat.</p>
<ul style="list-style-type: none"> <li>introduce disease that may cause the species to decline</li> </ul>	<p>The Project does not have the potential to introduce a disease that may cause the Fitzroy River Turtle population to decline.</p>
<ul style="list-style-type: none"> <li>interfere substantially with the recovery of the species</li> </ul>	<p>The Project will not interfere with the recovery of the Fitzroy River Turtle, as it will not directly or indirectly impact this species or its habitat.</p>
<p><b>Conclusion</b></p>	<p>Given the small footprint of water extraction infrastructure on the Dawson River, continuity of connectivity and insignificant impacts to water quality and hydrology downstream of the Project, it is considered unlikely that the Project will have a significant residual impact on the Fitzroy River Turtle.</p>

### 7.10.1.9 Migratory birds

Two migratory birds, Glossy Ibis and Latham's Snipe, are considered to have a moderate potential to occur in the Project area based on the habitat types present. Both of these species are discussed below.

#### *Description*

The Glossy Ibis utilises the shallows of swamps, floodwaters, sewage ponds and flooded, moist irrigated pasture (Morcombe and Stewart, 2013). The species also occasionally feeds in sheltered marine habitats (Morcombe and Stewart, 2013). Latham's Snipe prefers soft wet ground or shallow water with tussocks, wet paddocks, seepage below dams, irrigated areas, scrub or open woodland (Pizzey *et al.*, 2012).

#### *Current known threats*

The main threats listed for the Glossy Ibis and the Latham's Snipe is the loss and degradation of wetland habitat (DCCEEW, 2023i; c). This is most likely through changes in the drainage or hydrological regimes of wetlands, altered fire regimes, grazing, increased salinity, clearing, groundwater extraction and invasion by exotic plants (DCCEEW, 2023i; c).

Hunting is also a listed threat for the Latham's Snipe (DCCEEW, 2023c).

#### *Management plans*

There are no specific management plans in place for the Glossy Ibis or Latham's Snipe.

There is no published Conservation Advice, listed relevant threat abatement plans or recovery plans for the Glossy Ibis although the threat abatement plan for the European Red Fox is listed in relation to the Latham's Snipe. There is also a Wildlife Conservation Plan for Migratory Shorebirds in relation to the Latham's Snipe (DotE, 2015c).

#### *Survey effort*

Seasonal fauna surveys were undertaken over 22 days and carried out in consideration of relevant Commonwealth and Queensland surveys guidelines. Survey methods and effort included, but was not limited to:

- four systematic trap sites;
- 33 person hours spotlighting;
- 16 infrared cameras nights;
- 20.5 person hours active searching;
- 37 person hours bird surveying; and
- 282 diurnal and 104 nocturnal person hours of opportunistic observations.

Spotlighting, infrared cameras, active searching, bird survey and incidental/opportunistic observations are methods most relevant for the detection of the migratory birds potentially occurring and these were undertaken in preferred habitat in the Project area. The survey effort for the Project generally complied with survey guidelines. However, these are cryptic birds that are known to inconsistently use habitats and there is no guarantee that they would be recorded even during favourable conditions.

Further details about the field methods, survey timing, climatic conditions and limitations used to assess the Project area provided in the Terrestrial Ecology Assessment (Appendix F).



### *Survey outcomes and habitat assessments*

Neither of these species were recorded during field surveys, however, both are considered to have a moderate likelihood of occurrence in the study area.

Habitat occurs in the study area for the two migratory birds considered to potentially occur. The study area provides foraging habitat but is less likely to provide breeding habitat for any migratory species.

Dams and paddocks in the study area, when inundated, potentially provide habitat for the Glossy Ibis, while vegetated drainage lines potentially provide habitat for Latham's Snipe similar to the Australian Painted Snipe.

Potentially suitable habitat within the Project area is not simply estimated for the Glossy Ibis, as its habitat preferences are varied. It may use cleared gilgai, dams, or wetlands along the Dawson River and this occupancy is likely to be temporary and opportunistic. Habitat for the Latham's Snipe is considered to closely correspond with Australian Painted Snipe habitat, and it also is likely to use this habitat temporarily and opportunistically. Approximately 31.1 ha of potential wetland and drainage line habitat for the Australian Painted Snipe has been mapped within the Project site and ETL study area as well as an additional 68.5 ha of marginal habitat in the form of cleared gilgai habitat (refer also Australian Painted Snipe habitat mapping on Figure 7.13).

Potential habitat for these species does not occur in the proposed road realignment or water release/extraction infrastructure area.

### *Impact assessment*

Two key concepts are important in assessing the significance of impacts against the EPBC Act Significant Impact Guidelines. They are defined below.

#### Important habitat

Determining if an area of 'important habitat' for a migratory species listed under the EPBC Act occurs within the Project site and ETL study area is necessary in addressing the significant impact criteria for migratory species. Important habitat for a migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecological significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular lifecycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining (DotE, 2013).

It is considered unlikely that either the Project site and ETL study area provide important habitat for any migratory species as:

- no migratory species were observed in the study area during the seasonal surveys;
- there are large tracts of similarly disturbed areas on floodplains adjacent to the Dawson River and Banana Creek in the study area and broader region;
- the Project site and ETL study area is not at the limit of the distribution of either of the species considered to potentially occur; and
- the area in which the Project is proposed is not a specific area in which either the Glossy Ibis or Latham's Snipe is known to be declining. The extent of occurrence of the Latham's Snipe is considered to be stable at present (DCCEEW, 2023c).

### Ecologically significant proportion

An ecologically significant proportion of a migratory species will differ between species, however, the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates) should be considered in evaluating this (DoE, 2013a).

The broader study area is unlikely to provide important habitat for any migratory species. It is also unlikely to support an ecologically significant proportion of the population of a migratory species, as this would have been evident during the seasonal surveys. There was no evidence of important habitat areas, roost sites or other features that could be used by large numbers of these birds.

The Project will result in the clearing of potential habitat for these species, in the order of 1.0 ha of potential wetland and drainage line habitat and another 33.9 ha of marginal cleared gilgai habitat. Despite this clearing and disturbance, areas of potential habitat will remain within the broader region as habitats within the Project area are not particularly rare or unique in the region.

Indirect impacts to these migratory birds are considered unlikely. Indirect impacts related to noise and vibration, dust, lighting, vehicle strike, erosion and sedimentation will be temporary, and able to be managed and therefore minimal. Due to the already fragmented nature of the patches of these habitats in the landscape, edge effects and fragmentation are not expected to be significant and remaining areas of habitat in the study area are not proposed to be impacted by changes in surface water or flooding regimes.

There will be no facilitated impacts as a result of the Project.

There is no publicly available information about impacts to this species as a result of other Projects in the region. However, there is potential for incremental impacts migratory bird habitat as a result of mine Projects in the region, for which authorisation to clear vegetation and habitat has been granted. These Projects are approved with conditions and in accordance with the EO Act and EPBC Act, where significant impacts are likely, offsets will form part of those conditions. Where impacts are unlikely to be significant, the contribution to the cumulative impact is also unlikely to be significant.

### *Avoidance, mitigation and management*

Impacts to some areas of potential Glossy Ibis and Latham's Snipe habitat cannot be avoided due to the location of the coal seams, however, impacts to habitat along the ETL study area will be avoided where possible as part of the detailed design and siting of the proposed ETL.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near potential habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

### *Statutory requirements*

The Project will not be inconsistent with Australia's obligations under the Bonn Convention, CAMBA, JAMBA, ROKAMBA or an international agreement approved under subsection 209(4) of the EPBC Act. The terrestrial ecology assessment has:

- conducted a thorough desktop assessment to identify migratory species with the potential to be impacted by the Project;

- identified the habitat and lifecycle requirements of migratory species and considered their likelihood of occurrence;
- undertaken field surveys to target migratory species within the study area in consideration of Commonwealth and Queensland survey guidelines;
- identified potential habitat for migratory species within the study area;
- identified potential impacts of the Project on migratory species and their habitats;
- developed avoidance, mitigation and management measures to avoid or minimise potential impacts on migratory species and their habitat; and
- assessed the significance of the impacts in accordance with the Commonwealth ‘Significant Impact Guidelines 1.1: Matters of National Environmental Significance’ (DoE 2013a), which has indicated the Project will not result in a significant impact to migratory species.

**Rehabilitation requirements**

Rehabilitation of disturbed areas will occur progressively throughout the life of the mine and will continue after mining has ceased until rehabilitation objectives have been met.

Suitable topsoils and subsoils will be stripped from construction and mining areas, and where viable stored to maintain soil quality and used in rehabilitation to promote native vegetation from the soil seed bank. Revegetation will be also undertaken where required across the mine site.

**Significant impact assessment**

Table 7.23 provides an assessment of the significance of impacts to migratory birds against the Commonwealth Significant Impact Guidelines.

Table 7.23: Assessment of significance of impacts for the Glossy Ibis and Latham’s Snipe

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	
<ul style="list-style-type: none"> <li>• substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;</li> </ul>	<p>The habitats proposed to be impacted are unlikely to provide important habitat for a migratory species, therefore, important habitat will not be substantially modified, destroyed or isolated by the Project.</p>
<ul style="list-style-type: none"> <li>• result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or</li> </ul>	<p>The habitats proposed to be impacted are unlikely to provide important habitat for a migratory species. The Project area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive and predatory species, including feral animals such as the Feral Cat and Wild Dog have been identified as part of recent field surveys in the study area. Other species such as Foxes are likely to occur in the broader landscape and the study area is accessible to such species. These predatory species already pose a risk to the Glossy Ibis and Latham’s Snipe in the potential habitat areas present and the Project is unlikely to increase this threat. Similarly, the Project is unlikely to introduce new invasive or predatory species that are not already present and established in the study area as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.</p>

Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the migratory species.</li> </ul>	An ecologically significant proportion of the population of a migratory species is considered unlikely to occur in the potential habitats proposed to be impacted as this would have been recognisable during the seasonal surveys or evidence of such use identifiable. Therefore, the Project is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.
<b>Conclusion</b>	The Project will not result in a significant residual impact to migratory species listed under the EPBC Act.

### 7.10.2 Matters of state environmental significance

MSES values identified within the Project that require assessment under the 'Queensland Environmental Offsets Policy Significant Residual Impact Guideline' (DEHP, 2014) include the following:

- regulated vegetation;
- connectivity areas;
- wetlands and watercourses;
- waterways providing for fish passage;
- essential habitat;
- conservation significant flora species:
  - Solanum elaeagnifolium*;
- conservation significant fauna species:
  - Greater Glider;
  - Short-beaked Echidna;
  - Platypus; and
  - White-throated Snapping Turtle.

The impact assessments undertaken for the terrestrial and aquatic MSES listed above are discussed in further detail in the sections below, and in Appendix F, Terrestrial Ecology Assessment and Appendix G, Aquatic Ecology Assessment.

Significant residual impacts were identified to occur as a result of the Project for a MSES connectivity area.

The offset requirements for these matters are discussed in section 7.11.

#### 7.10.2.1 Regulated vegetation

##### *Endangered and of concern REs*

Approximately 10.0 ha of remnant vegetation is proposed to be cleared as a result of the Project (Figure 7.7 and Table 7.14). A small portion (0.1 ha) of this vegetation supports an of concern RE 11.3.3 under the VM Act. The remainder of impacted remnant vegetation is listed as least concern under the VM Act.

Offsets are required under the EO Act for significant residual impacts on remnant of concern and endangered REs. The SRI Guideline (EHP, 2014b) provides thresholds for clearing in remnant of concern vegetation that constitute a significant residual impact and trigger the provision of an environmental offset. With reference to



the significant residual impact criteria for regulated vegetation contained in Table 1 of the SRI Guideline, a significant residual impact will result from clearing more than 2.0 ha of remnant of concern REs with a sparse structure and more than 0.5 ha with a dense to mid-dense structure.

RE 11.3.3 is categorised by the Queensland Herbarium as having a sparse structure and less than 2.0 ha is proposed to be cleared. Therefore, the SRI Guideline criteria is not triggered, and a significant residual impact to of concern RE 11.3.3 will not occur from the Project.

#### *Vegetation within a defined distance of a wetland*

In accordance with the Queensland Offsets Regulation 2014, remnant REs that intersect with an area shown on the vegetation management wetlands map are classified as MSES. Clearing within 50 m of the defining bank of a wetland can trigger a significant impact under the SRI Guideline. Two vegetation management wetlands occur within the Project site. One comprises regrowth RE 11.3.3a vegetation (and is also mapped as GES wetland) and the other remnant RE 11.3.3 (and is also mapped as a HES wetland) (Figure 7.19).

The Project will require clearing the regrowth RE 11.3.3a wetland that is not a MSES under the EO Act. As shown in Figure 7.33, the Project will not require clearing of the remnant vegetation management mapped wetland. There will be no significant residual impact to the vegetation within a defined distance of a wetland from the Project.

#### *Vegetation within a defined distance of a watercourse*

In accordance with the Queensland Offsets Regulation 2014, remnant REs that occur within certain distances of watercourses are classified as MSES. Clearing within the defined distance of these watercourse REs can trigger a significant impact under the SRI Guideline.

A number of vegetation management watercourses are mapped by the Queensland Government within the Project area, including 1st, 2nd and 3rd order streams.

Two criteria in the Queensland SRI Guideline need to be triggered for a project to have a significant impact on a vegetation management watercourse:

- 1) the clearing is required to be greater than a minimum threshold for the relevant RE structural category (e.g. at least 0.5 ha for dense to mid-dense REs); and
- 2) the clearing is to occur within 5 m of the defining bank of the watercourse.

Small areas of remnant watercourse vegetation are proposed to be cleared within the defining distance of a 1st order stream. Appendix 3 of Queensland Environmental Offsets Policy lists the defined distance of REs for measuring significance of impacts to watercourse vegetation. For 1st and 2nd order streams the defined distance is 25 m from the defining banks.

The area of proposed clearing equates to 0.04 ha of remnant RE 11.5.15.

Approximately 0.4 ha of remnant RE 11.3.25 on the edge of the Dawson River riparian corridor will also be impacted to construct the water release/extraction infrastructure. However, canopy clearing will not take place in this area and disturbance will be restricted to the ground layer and understory. Therefore, there will be very limited vegetation removal in the regional ecosystem. Neither of these proposed impact areas trigger the significant residual impact test for regulated vegetation in the SRI Guideline. Additionally, neither of these areas of clearing or impact occur within 5 m of the (estimated) bank of the watercourse. Therefore, there will not be a significant residual impact to regional ecosystem associated with vegetation management watercourses.

### 7.10.2.2 Connectivity areas

In accordance with the Queensland SRI Guideline, The DES LFC Tool was used to assist in identifying and quantifying any significant impact as a result of the Project on habitat connectivity. This assessment uses the most current Queensland Government remnant vegetation mapping layer overlaid with the proposed Project disturbance area. The LFC Tool determined that the Project would result in a significant residual impact on local connectivity.

Therefore, impacts to 10.1 ha of remnant vegetation within the Project area will require offsets in accordance with the EO Act and Environmental Offsets Policy.

### 7.10.2.3 Wetlands

Wetlands of HES and wetlands, shown as a wetland on the map of Queensland wetland environmental values, are MSES under the EO Act; the HES wetland is the only wetland in the Project area that is within a WPA, and thus the only MSES wetland.

The MSES wetland is located in the south-west of the Project site and extends beyond the Project site into the additional investigation area, associated with remnant mapped RE 11.3.3 (Figure 7.4). This MSES wetland is 33.6 ha in size, of which approximately 20.2 ha within the Project site. No mapped MSES wetland area would be cleared for the Project.

The water balance assessment for the Project, found that, in the baseline scenario, the wetland is dry greater than 70% of the time, which will not be altered by the Project.

The GDE assessment found that this wetland community does not represent a GDE (3D Environmental, 2023).

The following impact assessment has been undertaken in Table 7.24 for this MSES wetland in accordance with the Queensland SRI Guideline and considering the impacts outlined above. The presented assessment was conducted as part of the Aquatic Ecology Assessment (Appendix G); a similar assessment was conducted as part of the Terrestrial Ecology Assessment (Appendix F) that also concluded the Project was unlikely to cause a significant residual impact to the wetland.

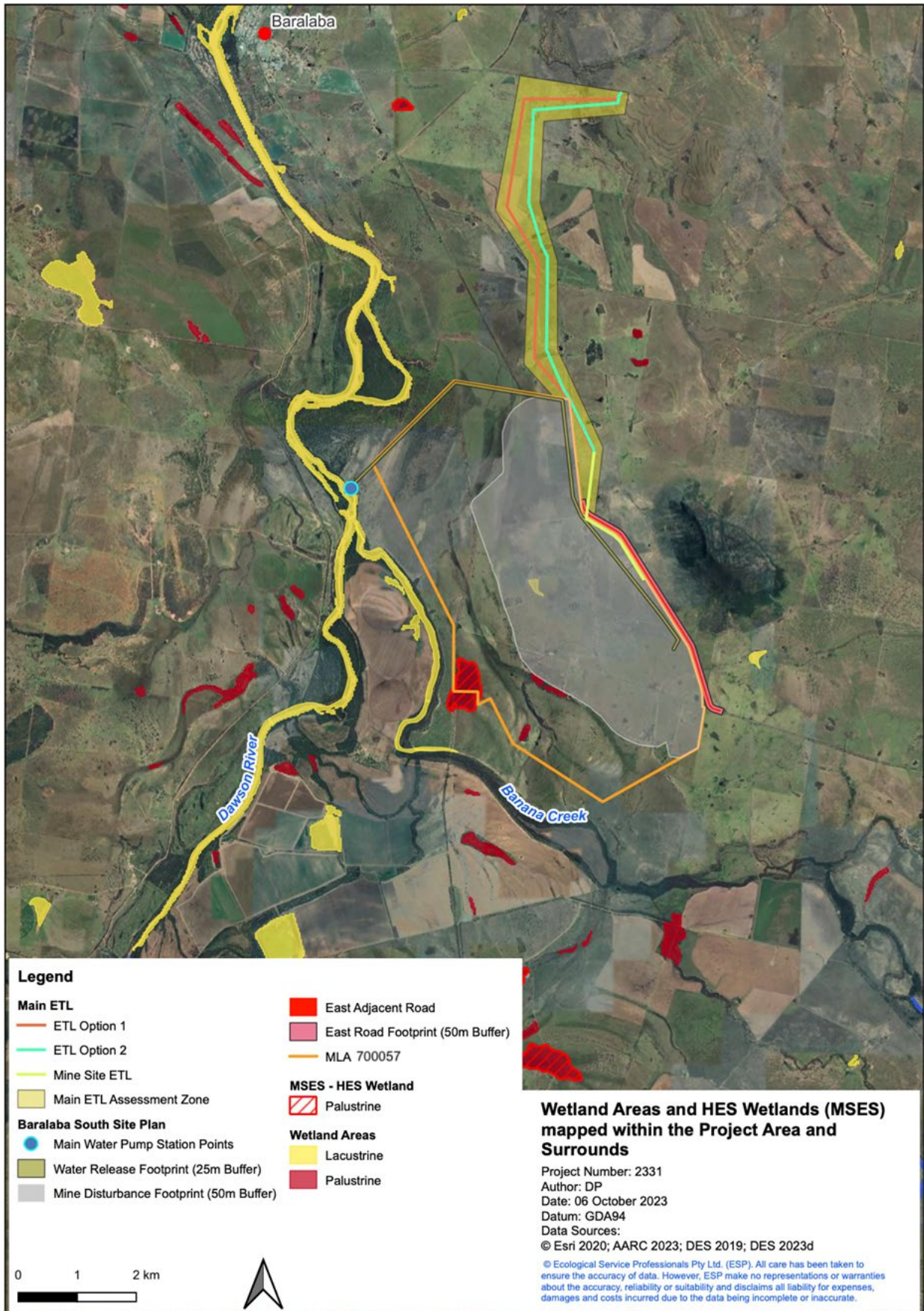


Figure 7.34: Proximity of wetland areas including HES wetlands to proposed Project area

Table 7.24: Assessment of significance of residual impacts for wetlands

Significance criteria	Assessment of significance
<p>An action is likely to have a significant impact on prescribed wetlands or watercourses if it is likely that the action will result in environmental values being affected in any of the following ways:</p>	
<ul style="list-style-type: none"> <li>• areas of the wetland or watercourse being destroyed or artificially modified;</li> </ul>	<p>The Project has been designed to avoid direct impacts to the mapped extent of wetland vegetation (in accordance with the VMA mapping) and the WPA trigger area. The northern waste rock emplacement will be located at least 1 km from the edge of the wetland vegetation.</p>
<ul style="list-style-type: none"> <li>• a measurable change in water quality of the wetland or watercourse – for example a change in the level of the physical and/or chemical characteristics of the water, including salinity, pollutants, or nutrients in the wetland or watercourse, to a level that exceeds the water quality guidelines for the waters; or</li> </ul>	<p>The water quality management system has been designed so that there are no changes to water quality or sedimentation in the wetland. Specifically, in the infrequent event of an uncontrolled water release, water will not flow towards or into the HES wetland.</p>
<ul style="list-style-type: none"> <li>• the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected; or</li> </ul>	<p>No direct impacts to the mapped extent of wetland habitat (vegetation) are proposed, and there is no predicted change to the water quality within the HES wetland.</p> <p>The Project has been designed to avoid direct impacts to the mapped extent of wetland vegetation (in accordance with the VMA mapping) and the WPA trigger area. The northern waste rock emplacement will be located at least 1 km from the edge of the wetland vegetation</p>
<ul style="list-style-type: none"> <li>• a substantial and measurable change in the hydrological regime or recharge zones of the wetland, e.g. a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland; or</li> </ul>	<p>The groundwater assessment concluded the wetland is reliant on direct rainfall, runoff and floodwaters and not on surface expressions of groundwater. As such, no significant change associated with groundwater interaction is expected.</p> <p>The overall hydrological regime (including flooding) of the wetland will remain unchanged.</p>
<ul style="list-style-type: none"> <li>• an invasive species that is harmful to the environmental values of the wetland being established (or an existing invasive species being spread) in the wetland.</li> </ul>	<p>Invasive aquatic plant species are already present within the broader catchment. Two species (namely, Water Lettuce and Olive Hymenachne) were identified as part of the field surveys at sites on the Dawson River downstream of the Project area but were not recorded in waterways of wetlands within the Project area (including the HES wetland) or Banana Creek (adjacent to the HES wetland). Given these species are known to occur in the Dawson River, and the wetland is sometimes inundated by flood waters from the Dawson River, there is potential that these invasive aquatic plant species may enter and establish within the wetland. However, as the wetland will remain ephemeral (and the invasive aquatic species typically occur in permanently inundated areas), the risk of these species becoming established in the wetland is considered low and no different from the current case.</p> <p>Invasive fish species (eastern mosquitofish and goldfish) were recorded at sites within and adjacent to / downstream of the Project area. No fish species were recorded in the HES wetland as it was dry during both surveys. Given invasive fish species already occur in the Project area, it is likely that they would already occur in the wetland under wet conditions. The risk of invasive fish species occurring in the wetland is unlikely to change significantly due to the Project</p>



Significance criteria	Assessment of significance
Conclusion	Direct impacts (vegetation clearing) from the Project will be avoided. The overall hydrological regime of the wetland will remain unchanged (e.g. ephemeral), and increases in peak flood velocities, duration and depth are not expected to result in significant impacts to aquatic flora and fauna.

#### 7.10.2.4 Protected wildlife habitat

Essential habitat is a MSES as prescribed under the EO Regulation. Essential habitat is mapped within the study area along the Dawson River for Ornamental Snake, in close proximity to the Project area. The Ornamental Snake was identified in the Project site during seasonal surveys. This species is listed as both a MNES and MSES and impacts to this species are addressed in section 7.10.1.4 under the Commonwealth Significant Impact Guidelines.

The significance of impacts of the Project to the *Xerothamnella herbacea*, Australian Painted Snipe, Koala, Squatter Pigeon (Southern), and migratory birds, which are all both MNES and MSES, are addressed in section 7.10.1.

Two threatened species (listed under both the EPBC Act and NC Act) will be assessed as MSES only for the purposes of this Project, as they were listed under the EPBC Act after the EPBC Act referral decision for the Project. The Greater Glider was identified within the additional study area and the White-throated Needletail is considered to have a moderate likelihood of overflying the study area. These species are assessed in the following sections.

Another two NC Act listed species, which were identified in the study area; *Solanum elachophyllum* and Short-beaked Echidna, and which are listed as MSES only, are assessed in the following sections.

The area mapped by the Queensland Government as essential habitat for *Bertya pedicellata* within the Project site was found not to support this species or any other significant plant species. In accordance with the DES information sheet, the ground-truthing of suitable habitat for species should be utilised over government mapping of habitat, given government mapping “does not have clear boundaries” for REs or essential habitat, nor does it “verify the ‘true’ extent and value” of the mapped vegetation as essential habitat for a species. Detailed ecological field surveys were undertaken for this Project, and areas of suitable habitat were identified for the threatened species observed and considered likely to occur. This ground-truthed data therefore takes precedence over the government mapping of essential habitat.

#### 7.10.2.5 *Solanum elachophyllum*

##### Description

*Solanum elachophyllum* is a perennial sub-shrub with underground rhizomes that can send up more or less shoots depending on seasonal conditions (Fensham *et al.*, 2017).

The species grows on fertile cracking clay soils primarily in Brigalow habitats but has also been known to occur in vegetation types that include Napunyah (*Eucalyptus thozetiana*) woodland, Brigalow woodland to open forest with an understorey of Wilga and Belah (*Casuarina cristata*), Southern Bonewood (*Macropteranthes leichhardtii*) thicket, Dawson River Gum woodland with Narrow-leaved Ironbark (*Eucalyptus crebra*) and *Eucalyptus tenuipes* (Bean, 2004; CSIRO, 2016).

##### Current known threats

A recent unpublished study by Fensham *et al.* proposes the species has undergone a 96.5% decline in all remnant Brigalow habitat in Queensland. This study estimates that the current population within all remnant Brigalow habitats is approximately 3,049,000 individuals (and 2,378,000 in remnant Brigalow habitat with

greater than 50% cover, i.e. viable long-term habitat) occupying an area of 44,200 ha at an average density of 68.98 individuals per ha (Fensham *et al.*, 2017).

Current known threats to *S. elachophyllum* include:

- habitat clearing or reduced habitat availability, including clearing populations in small remnants in rural areas;
- weeds, particularly introduced pasture grasses such as Buffel Grass;
- chance events causing a reduction in population sizes or loss of populations altogether, e.g. fire, drought, trampling by cattle;
- grazing by native and exotic animals; and
- genetic inbreeding depression due to small population sizes (DES, 2018b; Fensham *et al.*, 2017).

### *Management plans*

There are no management plans or recovery plans in place for this species.

### *Survey outcomes and habitat assessments*

A population of approximately 117 individuals of this species were identified within the Project site and another 42 individuals within the ETL study area. The Project is likely to result in the removal of approximately 159, including all individuals of the population within the Project site and up to 24 individuals within the ETL study area.

### *Avoidance, mitigation and management*

Impacts to the population of *S. elachophyllum* within the Project site cannot be avoided due to the location of the coal seams.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near *S. elachophyllum* habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

### *Significant residual impact assessment*

Table 7.25 provides an assessment of the significance of impact to *S. elachophyllum* against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.25: Assessment of significance of residual impacts for *Solanum elaeagnifolium*

Significance criteria	Assessment of significance
An action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:	
<ul style="list-style-type: none"> <li>lead to a long-term decrease in the size of a local population; or</li> </ul>	It is proposed that approximately 159 individuals of <i>S. elaeagnifolium</i> will be cleared as part of the Project. The largest population is located where mining activities are proposed, therefore, there are no opportunities to avoid this population. There is potential to avoid some or all individuals at the northern end of the ETL study area, however, up to 24 individuals may be disturbed in this area. This species is relatively commonly occurring in the region, with in excess of 10,000 individuals identified as part of the impact assessment for the Baralaba Coal Mine Train Load Facility in 2014. These populations were located within and adjacent to the Dawson Highway, approximately 30 km south of the Project area. Another population of more than 64,000 individuals was also identified by Eco Solutions & Management at another location in the vicinity of the train load out facility for another project in 2018. The Project will decrease the size of the population within the Project area; however, it is unlikely to affect the population in the local region.
<ul style="list-style-type: none"> <li>reduce the extent of occurrence of the species; or</li> </ul>	The species is known to occur over a relatively broad range between Nebo in the north-east, Emerald in the west, Rolleston in the south-west, Rockhampton in the east and Theodore in the south (CSIRO 2019; Fensham <i>et al.</i> , 2017). The population within the Project area occurs towards the southern end of its known occurrence. However, it is not nearing the limit of this species' distribution. As there are large numbers of this species known to occur in its southern distribution the overall extent of occurrence of the species is unlikely to be reduced by the Project.
<ul style="list-style-type: none"> <li>fragment an existing population; or</li> </ul>	The clearing proposed within the Project site will result in removal of the population in its entirety. The impacts to the population in the ETL study area will likely fragment habitat through clearing of the 20 m ETL easement, however, not to the extent that the population would be fragmented or remaining sub-populations isolated. All sub-populations will remain within 200 m of the Other.
<ul style="list-style-type: none"> <li>result in genetically distinct populations forming as a result of habitat isolation; or</li> </ul>	The populations proposed to be impacted are already separate from each other and other populations in the region. The proposed clearing of these populations will not affect the genetic structure or flow of any individuals that remain in the region, nor will it isolate any populations.
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or</li> </ul>	The Project area is located within a modified rural landscape where introduced plants and feral animals are already present. Invasive species and feral animals such as Buffel Grass, Green Panic, Feral Pigs and European Rabbit, have been identified as part of field surveys in the study area. These invasive species already pose a threat to <i>S. elaeagnifolium</i> habitat within the Project area and in the surrounding landscape and the Project is unlikely to increase this threat. Buffel Grass is considered a key threat to this species and was recorded in the ground layer in which the population was identified. Similarly, the Project is unlikely to introduce new invasive weed species that are not already present and established in the Project area as controls will be put in place as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.
<ul style="list-style-type: none"> <li>introduce disease that may cause the population to decline; or</li> </ul>	Disease is not a known threat to <i>S. elaeagnifolium</i> . The Project is unlikely to introduce disease that may cause the species to decline.



Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>interfere with the recovery of the species; or</li> </ul>	The populations within the Project area are small and isolated and therefore, probably do not contribute significantly to the national population of <i>S. elachophyllum</i> (e.g. through genetic diversity or population size). It has been recognised that large populations within viable Brigalow habitat should be targeted for conservation and are key to the long-term stabilisation and recovery of the species (Fensham <i>et al.</i> , 2017). Therefore, clearing of these populations in the Project area is unlikely to interfere with the recovery of the species.
<ul style="list-style-type: none"> <li>cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.</li> </ul>	The populations located in the Project area are unlikely to be ecologically significant for this species as they are not at the limit of the species occurrence or particularly large populations. The species has been recorded elsewhere in the region in significantly larger populations.
<b>Conclusion</b>	The Project is considered unlikely to significantly impact <i>S. elachophyllum</i> as the populations in the Project area are small, isolated, and are not considered to represent ecologically significant locations of this species.

### 7.10.2.6 Greater Glider

#### Description

The Greater Glider was listed as vulnerable under the EPBC Act and NC Act at the time of the controlled action decision for the Project. Since this time, it is acknowledged that the listing status for the Greater Glider has been upgraded to endangered under the NC Act and the EPBC Act.

The taxonomy of the Greater Glider is currently unresolved, with recent molecular evidence suggesting that the one species (*Petauroides volans*) may be three separate species, namely the southern (*P. volans*), central (*P. armillatus*) and northern (*P. minor*) Greater Gliders (McGregor *et al.*, 2020). This work has not yet been formally recognised across all jurisdictions, professional societies or in recent publications that deal with the taxonomic classification of Australian mammals.

The Greater Glider most likely to occur within the study area is the central species or form which is listed as endangered under both the EPBC Act and NC Act. In the interests of consistency, *P. volans* is retained as a single in this assessment.

The Greater Glider is a nocturnal species and uses tree hollows during the day to rest (van Dyck and Strahan, 2008). It may glide over distances of up to 100 m, however, it appears to have low dispersal ability and typically small home ranges of 1-4 ha. The species has an almost exclusive diet of eucalypt leaves and occasionally flowers or buds (DCCEEW, 2023f; TSSC, 2016a; van Dyck and Strahan, 2008). Although the species is known to feed on a range of eucalypt species, in any particular area it is likely to only forage on one or two species (van Dyck and Strahan, 2008).

The Greater Glider occurs in a range of eucalypt-dominated habitats, including low open forests on the coast to tall forests in the ranges and low woodland westwards of the Dividing Range. It does not use rainforest habitats (van Dyck *et al.*, 2013; van Dyck and Strahan, 2008). This species favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of eucalypt species (DCCEEW, 2022h; TSSC, 2016a). The Greater Glider has an almost exclusive diet of eucalypt leaves and occasionally flowers or buds (DCCEEW, 2023e; TSSC, 2016a; van Dyck and Strahan, 2008).

### *Current known threats*

Current known threats to the Greater Glider include (TSSC, 2016a; DCCEEW 2023f):

- high intensity/frequency of bushfires causing population loss or decline;
- habitat loss and fragmentation (through clearing and logging, and timber production), and the destruction of senescent trees, causing loss of connectivity and large hollow-bearing habitat trees;
- climate change affecting habitat suitability and resulting in a range contraction;
- timber production and harvesting in high-quality habitat areas;
- barbed wire fencing resulting in entanglement and occasional losses of individuals;
- hyper-predation by owl species;
- Phytophthora (*Phytophthora cinnamomi*) root fungus, which is known to impact the health of Eucalypts (TSSC 2016a).
- predation Feral Cats and European Red Foxes; and
- loss of hollow-bearing trees resulting in increased competition with Sulphur-crested Cockatoo.

### *Management plans*

The following plans and advice are in place for the Greater Glider, which have been considered in preparing this assessment:

- Conservation Advice: Conservation Advice has been prepared for the Greater Glider (southern and central), which recommends conservation and management actions for the species. The Conservation Advice also details threats to the species and assigns consequence ratings to the threat (DCCEEW, 2022).
- Threat Abatement Plan: No threat abatement plans have been identified as being relevant for this species by the DAWE. However, a Threat Abatement Plan for disease in natural ecosystems caused by *Phytophthora cinnamomi* has been prepared (DoE, 2014).
- Recovery Plan: There is currently no recovery plan in place for the Greater Glider, however, the DAWE SPRAT Profile identifies that a Recovery Plan is required (DCCEEW, 2023e).

### *Survey outcomes and habitat assessments*

No evidence of the Greater Glider was detected in the Project area during the seasonal fauna surveys; however, it was determined that the Greater Glider has a moderate likelihood of occurring within the Project area. The Greater Glider was recorded within remnant riparian vegetation (i.e. RE 11.3.25) that occurs along an anabranch of the Dawson River, north of the Project site during surveys conducted within the additional investigation area. All remnant alluvial REs mapped within the additional investigation area, associated with the Dawson River, its anabranch and Banana Creek, are considered habitat for the Greater Glider. This habitat accounts for approximately 767.5 ha within the study area.

This habitat includes a narrow strip of Greater Glider habitat in the form of RE 11.3.25 that will be traversed by the proposed water extraction/release infrastructure to the Dawson River. This area accounts for 0.4 ha; however, no clearing of canopy habitat trees is proposed in this area. Only understorey and ground layer vegetation clearing will be undertaken to construct the infrastructure at this location.

### *Avoidance, mitigation and management*

Impacts to Greater Glider habitat along the Dawson River will be minimised where possible as part of the detailed design and siting of the proposed water release/extraction infrastructure. In this area the infrastructure will traverse the narrowest section of riparian vegetation where possible and disturbance will be

selective and limited to the understory and ground layer to minimise overall disturbance to the riparian community.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Greater Glider habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a ‘Permit to Disturb’ procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

**Significant residual impact assessment**

Table 7.26 provides an assessment of the significance of impact to the Greater Glider against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.26: Assessment of significance of residual impacts for the Greater Glider

Significance criteria	Assessment of significance
An action is likely to have a significant impact on vulnerable wildlife if the impact on the habitat is likely to:	
<ul style="list-style-type: none"> <li>• lead to a long-term decrease in the size of a local population; or</li> </ul>	The extent of impacts to understory vegetation within 0.4 ha of potential habitat for this species along the Dawson River, in RE 11.3.25, is unlikely to decrease the size of the population that occurs along the Dawson River and associated tributaries.
<ul style="list-style-type: none"> <li>• reduced extent of occurrence of the species; or</li> </ul>	The Project will not result in impacts to habitat for this species and extensive habitat occurs within the riparian corridor associated with the Dawson River. Therefore, the local extent of occurrence by this species will not be reduced.
<ul style="list-style-type: none"> <li>• fragmentation of an existing population; or</li> </ul>	Greater Glider habitat is not proposed to be cleared for the Project. The Project will not affect the genetic structure or flow of any populations in the region, nor will it isolate any populations.
<ul style="list-style-type: none"> <li>• result in genetically distinct populations forming as a result of habitat isolation; or</li> </ul>	As the local population is unlikely to be fragmented or become isolated, the gene flow within the local population is unlikely to be affected by the Project.
<ul style="list-style-type: none"> <li>• result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species’ habitat; or</li> </ul>	The study area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive and predatory species, including feral animals such as the Feral Cat and Wild Dog have been identified as part of recent field surveys in the study area. Other species such as foxes are likely to occur in the broader landscape and the study area is accessible to such species. The Project is unlikely to introduce new invasive or predatory species that are not already present and established in the study area as standard and industry recognised controls will be put in place as part of the Weed and Pest Management Plan.
<ul style="list-style-type: none"> <li>• introduce disease that may cause the population to decline, or</li> </ul>	Diseases or viruses are not listed as a key threat to the Greater Glider in the current Conservation Advice (DCCEEW 2023f). However, the Phytophthora root fungus is known to impact the health of eucalypt species, which the Greater Glider is reliant upon. Phytophthora is known to occur in all states of Australia and is likely to be present in the landscape in which the study area is located, it is considered unlikely that the Project will introduce disease that may cause this species to decline

Significance criteria	Assessment of significance
<ul style="list-style-type: none"> <li>interfere with the recovery of the species; or</li> </ul>	Greater Glider habitat is not proposed to be cleared for the Project and extensive riparian habitat occurs along the Dawson River and its tributaries in the region. The Project is considered unlikely to interfere with the recovery of the species.
<ul style="list-style-type: none"> <li>disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.</li> </ul>	Greater Glider habitat is not proposed to be cleared for the Project. Additionally, indirect impacts from the Project are not predicted to impact riparian or floodplain communities. Therefore, ecologically significant locations for the Greater Glider will not be impacted.
<b>Conclusion</b>	The Project will not result in a significant residual impact on the Greater Glider.

### 7.10.2.7 Yellow-bellied Glider (south-eastern)

#### Description

The Yellow-bellied Glider occurs in Eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Kavanagh *et al.*, 1995). The Yellow-bellied Glider is nocturnal and shelters in hollows found in large, old trees, usually more than one metre in diameter (TSSC 2022a). Hollow-bearing trees are a critical habitat feature for the species (TSSC 2022a). The diet of the Yellow-bellied Glider comprises of sap drawn from incisions in the trunks of a limited number of trees typically of the genus *Eucalyptus* or *Corymbia*. The species also feeds on insects, spiders, eucalypt nectar and pollen, insect exudates and manna (TSSC 2022a). Smooth-barked eucalypts are important due to the range of foraging substrates (and therefore food resources) they provide, as loose bark hanging in strips from these trees provides shelter for insect prey (Eyre and Smith, 1997). Yellow-bellied gliders (south-eastern) also require some level of floristic diversity to provide a year-round food supply, and they are unlikely to persist in forests dominated by only one or two tree species (TSSC 2022a).

The species shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter with foraging (TSSC 2022a). The species has very low dispersal capabilities over spaces larger than its gliding distance (TSSC 2022a). The Conservation Advice indicates that management should be guided by the average gliding performance, which was reported as being on average 25 m (TSSC 2022a).

#### Current known threats

Current known threats to the Yellow-bellied Glider include:

- habitat loss, disturbance and modification through clearing, severe burning and timber harvesting;
- climate change affecting habitat suitability and resulting in a range contraction through increased temperatures and changes to precipitation patterns;
- introduced species resulting in increased predation by Red Foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) and habitat degradation by feral deer; and
- barbed wire fencing resulting in entanglement and occasional losses of individuals.

#### Management plans

The following plans and advice are in place for the Yellow-bellied Glider:

- Conservation Advice: Approved Conservation Advice has been prepared for the Yellow-bellied Glider, which recommends conservation and management actions for the species. The Conservation Advice also details threats to the species and assigns consequence ratings to the threat (DCCEE 2023g); and



- Recovery Plan: There is currently no recovery plan in place for Yellow-bellied Glider.

#### *Survey outcomes and habitat assessment*

No evidence of the Yellow-bellied Glider was detected in the Project area during the seasonal fauna surveys, however, it was determined that the Greater Glider has a moderate likelihood of occurring within the Project area.

The Yellow-bellied Glider was recorded within remnant riparian vegetation (RE 11.3.3) along Banana Creek (Figure 18). Extensive areas of riparian vegetation dominated by Eucalyptus species occur throughout the Banana Creek and Dawson River systems and provide potential habitat (767.5 ha) for the Yellow-bellied Glider. A small area of this habitat (i.e. approximately 0.4 ha) on the edge of RE 11.3.25 on the Dawson River will be traversed by the proposed water extraction/release infrastructure.

There is limited potential for the species to disperse into vegetation within the Project site, road realignment corridor or the ETL study area as this vegetation is separated from larger tracts of more suitable habitat, i.e. riparian habitat associated with the Dawson River and its tributaries, by cleared areas of greater than 100 m. Given low dispersal capability of the Yellow-bellied Glider and the highly fragmented and small areas of vegetation within the Project area, it is considered unlikely that the species utilises vegetation within the Project area. Additionally, vegetation within the Project area typically lacks many of the habitat attributes that are considered important for the species such as large hollow-bearing trees and a diversity of eucalypt species. This suggests that this species is unlikely to use vegetation within the Project site, road realignment corridor or ETL study area.

#### *Avoidance, mitigation and management*

Impacts to Yellow-bellied Glider habitat along the Dawson River will be minimised where possible as part of the detailed design and siting of the proposed water release/extraction infrastructure. In this area the infrastructure will traverse the narrowest section of riparian vegetation where possible and disturbance will be selective and limited to the understory and ground layer to minimise overall disturbance to the riparian community.

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Greater Glider habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

#### *Significant impact assessment*

provides an assessment of the significance of impact to the Greater Glider against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.27: Assessment of significance of residual impacts for the Yellow-bellied Glider

Significance criteria	Assessment of significance
An action is likely to have a significant impact on vulnerable wildlife if the impact on the habitat is likely to:	
<ul style="list-style-type: none"> <li>Lead to a long-term decrease in the size of a local population; or</li> </ul>	The extent of impacts to understory vegetation within 0.4 ha of potential habitat for this species along the Dawson River, in RE 11.3.25, is unlikely to decrease the size of the population that occurs along the Dawson River and associated tributaries.
<ul style="list-style-type: none"> <li>reduced extent of occurrence of the species; or</li> </ul>	The project will not result in impacts to habitat for this species and extensive habitat occurs within the riparian corridor associated with the Dawson River. Therefore, the local extent of occurrence by this species will not be reduced.
<ul style="list-style-type: none"> <li>fragmentation of an existing population; or</li> </ul>	Yellow-bellied Glider habitat is not proposed to be cleared for the Project. The project will not affect the genetic structure or flow of any populations in the region, nor will it isolate any populations.
<ul style="list-style-type: none"> <li>result in genetically distinct populations forming as a result of habitat isolation; or</li> </ul>	As the local population is unlikely to be fragmented or become isolated, the gene flow within the local population is unlikely to be affected by the Project.
<ul style="list-style-type: none"> <li>result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or</li> </ul>	The study area is located within a modified rural landscape where introduced plants and feral predators are present. Invasive and predatory species, including feral animals such as the Feral Cat and Wild Dog have been identified as part of recent field surveys in the study area. Other species such as Foxes are likely to occur in the broader landscape and the study area is accessible to such species. The project is unlikely to introduce new invasive or predatory species that are not already present and established in the study area as standard and industry recognised controls will be put in place as part of the Weed and Pest Animal Management Plan and which are referred to in section 7.3.3.
<ul style="list-style-type: none"> <li>introduce disease that may cause the population to decline, or</li> </ul>	Diseases or viruses are not listed as a key threat to the Yellow-bellied Glider in the current Conservation Advice (DCCEEW 2023k). However, the Phytophthora root fungus is known to impact the health of eucalypt species, which the Yellow-bellied Glider is reliant upon. As Phytophthora is known to occur in all states of Australia and is likely to be present in the landscape in which the study area is located, it is considered unlikely that the Project will introduce disease that may cause this species to decline.
<ul style="list-style-type: none"> <li>interfere with the recovery of the species; or</li> </ul>	Yellow-bellied Glider habitat is not proposed to be cleared for the Project and extensive riparian habitat occurs along the Dawson River and its tributaries in the region. The project is considered unlikely to interfere with the recovery of the species.
<ul style="list-style-type: none"> <li>disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.</li> </ul>	Yellow-bellied Glider habitat is not proposed to be cleared for the Project. Additionally, indirect impacts from the Project are not predicted to impact riparian or floodplain communities. Therefore, ecologically significant locations for the Yellow-bellied Glider will not be impacted.
Conclusion	The project will not result in a significant residual impact on the Yellow-bellied Glider.

### 7.10.2.8 Short-beaked Echidna

#### *Description*

The Short-beaked Echidna is listed as special least concern under the NC Act. This species occurs throughout mainland Australia and Tasmania, as well as King, Flinders and Kangaroo Islands (Menkhorst and Knight, 2011). The Short-beaked Echidna occurs in almost all terrestrial habitats except intensively managed farmland. It shelters in logs, crevices, burrows or piles of litter and feeds on ants, termites and other soil invertebrates, particularly beetle larvae (Menkhorst and Knight, 2011).

#### *Current known threats*

The likely predators of the Short-beaked Echidna are Feral Cats, European Red Fox, Wild Dogs and Goannas (NPWS, 1999).

#### *Management plans*

There are no threat abatement plans or recovery plans for this species and it is not considered a threatened or at-risk species.

#### *Survey outcomes and habitat assessments*

The Short-beaked Echidna was recorded in the study area during seasonal surveys resulting in a high likelihood of occurrence for the species. Remnant habitats (i.e. 10.1 ha) would be preferred by this species in the Project area (section 7.4.4.3, Table 7.15 and Figure 7.16).

The Project would result in the clearing of approximately 10.1 ha of habitat for this species. However, the Short-beaked Echidna is a mobile species and is known to use cleared and disturbed habitats.

#### *Avoidance, mitigation and management*

Impacts to some areas of Short-beaked Echidna habitat cannot be avoided due to the location of the coal seams. A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near Short-beaked Echidna habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a 'Permit to Disturb' procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

#### *Significant residual impact assessment*

Table 7.28 provides an assessment of the significance of impact to the Short-beaked Echidna against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.28: Assessment of significance of residual impacts for the Short-beaked Echidna

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a special least concern (non-migratory) animal wildlife habitat if it is likely that it will result in:	
<ul style="list-style-type: none"> <li>a long-term decrease in the size of a local population; or</li> </ul>	Approximately 10.1 ha of suitable habitat formed by remnant vegetation is proposed to be cleared as part of the Project. Short-beaked Echidna habitat is widespread in the region and this species occupies a broad range of habitats of varying quality, therefore, this clearing is unlikely to lead to a long-term decrease in the local population.
<ul style="list-style-type: none"> <li>a reduced extent of occurrence of the species; or</li> </ul>	Short-beaked Echidna habitat is proposed to be cleared as part of the Project. However, the reduction by 10.1 ha of habitat is considered unlikely to affect the ability of the species to persist in the local area because of the extent of habitat that will remain along the Dawson River, Banana Creek and Mount Ramsay. Therefore, the extent of occurrence of this species will not be reduced as a result of the Project.
<ul style="list-style-type: none"> <li>fragmentation of an existing population; or</li> </ul>	Connectivity of habitat will not be compromised as a result of the Project as this species is known to use disturbed and cleared areas. Additionally, connective remnant habitats along the Dawson River and its tributaries will remain in the region. As the Short-beaked Echidna is a mobile species the local population is unlikely to be fragmented due to the proposed habitat clearing.
<ul style="list-style-type: none"> <li>result in genetically distinct populations forming as a result of habitat isolation; or</li> </ul>	As the local population is unlikely to be fragmented or become isolated, the gene flow within the local population is unlikely to be affected by the Project.
<ul style="list-style-type: none"> <li>disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.</li> </ul>	Standard industry recognised measures will be employed during the vegetation clearing stages of the Project to minimise harm and disruption to animals and breeding places in accordance with the requirements of the Queensland NC (Wildlife Management) Regulation. This will reduce the risk and extent of disruption to the breeding cycle of Short-beaked Echidnas in the study area. Additionally, connectivity of habitat will not be severed, and the Short-beaked Echidna will be able to continue to move through the landscape and forage in extensive surrounding habitat areas.
<b>Conclusion</b>	Given the relatively small area of habitat proposed to be cleared, the prevalence of this species in the region, the overall maintenance of connectivity of habitat in the region, and the mobility of the species, it is considered unlikely that the Project will have a significant residual impact on the Short-beaked Echidna.

### 7.10.2.9 White-throated Needle-tail

#### Description

The White-throated Needle-tail is listed as vulnerable and migratory under the EPBC Act and NC Act. This species is widespread in eastern and south-eastern Australia where it spends the non-breeding season (DCCEEW, 2023e). The islands of the Torres Strait are known to be the major point of entry for the White-throated Needle-tail into Australia (DCCEEW, 2023e).

This species is almost exclusively aerial, which means it rarely alights on the ground or on vertical substrates, and as such, conventional habitat descriptions are not useful (DCCEEW, 2023e). Nonetheless, it tends to fly over preferred habitat types, including above mainly wooded areas and larger tracts of vegetation, particularly forest, although they have also been recorded foraging above disturbed areas, i.e. above bushfires or slashed



paddocks. Their diet consists of flying insects, which they forage aerially for (DCCEEW, 2023e; DotE, 2015a). The species roosts in tree hollows in tall trees on ridge-tops, on bark or rock faces and it is thought to have traditional roost sites (DotE, 2015a). However, roosting on terrestrial features is probably uncommon and it is thought to roost aerially (DCCEEW, 2023e). Large tracts of native vegetation, particularly forest, may be important for this species in Australia (DotE, 2015a).

#### *Current known threats*

Known threats to the White-throated Needle-tail in Australia are limited to collision with overhead wires, windows and lighthouses (TSSC, 2019a).

#### *Management plans*

The following plans and advice are available for the White-throated Needle-tail, which have been considered in preparing this assessment:

- Conservation Advice: Approved Conservation Advice has been prepared for the White-throated Needle-tail, which recommends conservation and management actions, stakeholder engagement, survey, monitoring and research priorities for the species (TSSC, 2019a).
- Threat Abatement Plan: No threaten abatement plans have been identified as relevant to this species.
- Recovery Plan: There is no recovery plan in place for this species. The Conservation Advice recommends that a recovery plan is not required for the species as the Conservation Advice provides “sufficient direction to implement priority actions and mitigate against key threats” (TSSC, 2019a).

#### *Survey outcomes and habitat assessments*

This species was not recorded in the study area during seasonal surveys; however, it is widespread, and it has been recorded in the region and it was determined that the White-throated Needle-tail has a moderate likelihood of occurring within the Project area. The White-throated Needle-tail has the potential to overfly all types of habitats within the study area as part of wider foraging movements, although forested and treed areas are likely to be preferred. There is no evidence of traditional roost sites within the study area. Potential overfly habitat in the study area equates to approximately 1,136 ha and potential overfly habitat within the Project area accounts for approximately 93.6 ha of forested areas (Figure 7.17).

#### *Avoidance, mitigation and management*

A range of plans and procedures will be implemented during mine construction, operation and rehabilitation, which will manage and monitor impacts to terrestrial ecology. In particular, the following protocols and plans will be developed to manage clearing in and near White-throated Needle-tail habitat to minimise harm to individuals and protect habitat to be retained, including:

- vegetation clearing protocols, including a ‘Permit to Disturb’ procedure;
- Species Management Program;
- Weed and Pest Management Plan; and
- Erosion and Sediment Control Plan.

#### *Significant residual impact assessment*

Table 7.28 provides an assessment of the significance of impact to the White-throated Needle-tail against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.29: Assessment of significance of residual impacts for the White-throated Needletail

Significance criteria	Assessment of significance
An action is likely to have a significant impact on vulnerable wildlife if the impact on the habitat is likely to:	
Lead to a long-term decrease in the size of a local population; or	Approximately 16.7 ha of potential overfly habitat will be impacted or removed for the Project. However, this species is unlikely to use the vegetation within the Project area specifically for foraging or roosting, as it is an almost exclusively aerial species. This species is known to forage above vegetation and disturbed areas. Therefore, the proposed impacts are unlikely to lead to a long-term decrease in the size of a local population.
reduced extent of occurrence of the species; or	The project is considered unlikely to impact foraging or movement behaviour of the White-throated Needletail that may occur in the region and therefore will not reduce the extent of occurrence of this species.
fragmentation of an existing population; or	This is a highly mobile and an almost exclusively aerial species. The project will not fragment a population of this species that may forage in the region.
result in genetically distinct populations forming as a result of habitat isolation; or	The project will not affect genetic flow of any populations that may forage within the region.
result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or	This is an almost exclusively aerial species. Therefore, the invasive terrestrial plants and feral animals known to occur in the study area are unlikely to pose a threat to this species. It is highly unlikely that the Project would result in invasive species becoming established in White-throated Needletail habitat.
introduce disease that may cause the population to decline, or	Disease is not a known threat to this species. Therefore, the Project is unlikely to introduce any disease that may cause the population to decline.
interfere with the recovery of the species; or	The project is considered unlikely to interfere with the foraging or movement behaviour of White-throated Needletail that may occur in the region as it will not impact the aerial habitat for this species. Therefore, the Project will not interfere with the recovery of the species.
disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.	The study area is not likely to present an ecologically significant location for this species as no breeding, feeding or nesting sites were observed for this species. The species is unlikely to use the vegetation and habitats in the study area due to its aerial feeding and roosting behaviour. Therefore, such ecological significant locations will not be impacted by the Project.
<b>Conclusion</b>	The project will not result in a significant residual impact on the White-throated Needletail.

### 7.10.2.10 Platypus

#### Description

Platypus occur in eastern Australia from Cooktown in north Queensland to Victoria and Tasmania. This species is not listed as threatened under the EPBC Act, but under state legislation is considered to be an iconic species and is protected more generally as 'special least concern' under the NC Act.

Platypus inhabit freshwater streams, rivers, lakes and dams. They are typically nocturnal, feeding on aquatic invertebrates along the stream bed from dusk until dawn (Carrick *et al.*, 2008). When not active, Platypus rest in burrows in the riverbank that typically open at the water's edge among tree roots and overhanging vegetation. Platypus can tolerate a relatively wide range of environmental conditions but prefer habitat that

has an abundance of invertebrate prey, permanent pools and runs, moderate to good water quality, and steep well-vegetated banks for burrows.

The distribution of Platypus is very sparse in the central Queensland region (BAAM, 2009). The closest published records are approximately 60 km downstream near Boolburra, and approximately 85 km upstream and to the south of Moura (ALA, 2023) (Figure 7.28). No Platypus have been recorded during previous surveys completed within the region (BMT WBM, 2011; frc environment, 2014).

#### *Survey outcomes and habitat assessments*

No Platypus were sighted at any of the sites in the current surveys and no evidence of Platypus, such as burrows were observed. The Dawson River and Anabranche, and lower reaches of Banana Creek and Shirley's Gully have potentially suitable habitat available to support this species, including permanent pool habitat and available instream structure for resting/refuge. However, they are not considered ideal as they lack several of the preferred habitat features associated with this species (clear, flowing water with coarse bed substrates (e.g. cobble and gravel), riffle zones and dense coverage of submerged aquatic vegetation). The banks at these sites are considered suitable for burrows, however, no burrows were observed. Overall, given the habitat requirements and distribution range of Platypus it is considered a low likelihood that Platypus would occur in these waterways within the study area.

#### *Avoidance, mitigation and management*

There is no potential Platypus habitat within the Project footprint; as such, direct impacts have been avoided. The exception is the potential for a very small area (less than 500 m<sup>2</sup>) to be affected by construction of water extraction or discharge infrastructure. The potential impacts of this will be minimised and mitigated by reducing the construction footprint of the water extraction infrastructure as far as practical and limiting disturbance of the bank on which it will be positioned.

The potential indirect impacts to Platypus habitat as a result of impacts to water quality and hydrology will be minimised and mitigated by developing and implementing the following management and monitoring plans for the site:

- Water Management Plan;
- Erosion and Sediment Control Plan;
- Progressive Rehabilitation and Closure Plan;
- Water Quality Monitoring Program;
- Receiving Environment Monitoring Program.

The REMP is to monitor the impacts of the Project on the environmental values of the receiving environment (including water quality, flows and biological health indicators such as macroinvertebrates), and to provide feedback for continuous improvement of environmental management if required.

#### *Significant residual impact assessment*

Table 7.30 provides an assessment of the significance of impact to the Platypus against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.30: Assessment of significance of residual impacts for the Platypus

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a special least concern (non-migratory) animal wildlife habitat if it is likely that it will result in:	
<ul style="list-style-type: none"> <li>a long-term decrease in the size of a local population; or</li> </ul>	<p>Mortality of individual Platypus is not expected, nor are impacts to breeding (noting that it has not been established that breeding of this species occurs within the study area).</p> <p>Likewise, no significant impacts to water quality or hydrology are predicted downstream of the Neville Hewitt Weir, and as such no impacts to individuals or breeding populations in the reaches downstream of the weir are predicted.</p>
<ul style="list-style-type: none"> <li>a reduced extent of occurrence of the species; or</li> </ul>	<p>The Project will not reduce the extent of occurrence of the species.</p>
<ul style="list-style-type: none"> <li>fragmentation of an existing population; or</li> </ul>	<p>Connectivity of habitat will not be compromised as a result of the Project. Connectivity of remnant habitats along the Dawson River will not be compromised.</p>
<ul style="list-style-type: none"> <li>result in genetically distinct populations forming as a result of habitat isolation; or</li> </ul>	<p>As the local population is unlikely to be fragmented or become isolated, the gene flow within the local population is unlikely to be affected by the Project.</p>
<ul style="list-style-type: none"> <li>disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.</li> </ul>	<p>It has not been established that there is a breeding population of Platypus in the Dawson River or other watercourses adjacent to the Project area.</p> <p>Regardless, the Project will not result in any adverse impacts to potential Platypus breeding habitat, or any reductions in water or habitat quality (that could lead to decreased fitness or breeding success).</p>
<b>Conclusion</b>	<p>Given the small footprint of water extraction infrastructure on the Dawson River, continuity of connectivity and insignificant impacts to water quality and hydrology downstream of the Project, it is considered unlikely that the Project will have a significant residual impact on the Platypus.</p>

### 7.10.2.11 White-throated Snapping Turtle

The White-throated Snapping Turtle is listed as endangered under the NC Act and Critically Endangered under the EPBC Act (though was not listed at the time of the controlled action declaration and is thus not considered an MNES for the Project). The Federal Minister for the Environment approved Conservation Advice for the species in 2014 (TSSC, 2014) and a national recovery plan for the species has been prepared and adopted in April 2021 (Commonwealth of Australia, 2020).

No significant impacts to the Fitzroy River Turtle are predicted as a result of the Project, as described in section 7.10.1.8. The assessment of potential impacts to the White-throated Snapping Turtle is consistent with the assessment of impacts to the Fitzroy River Turtle, as these two species have similar habitat preferences and requirements and could be affected by the same impacting processes. That is:

- no direct impacts to White-throated Snapping Turtle habitat are proposed, as there is no suitable habitat for this species within the Project area; and
- no indirect, facilitated or cumulative impacts to the White-throated Snapping Turtle, as there will be no significant impacts to water quality, water levels or flows in the receiving environment that would affect the habitat for this species (including the Neville Hewitt Weir impoundment and reaches of the Dawson River downstream of the Neville Hewitt Weir).



#### 7.10.2.12 Waterways providing for fish passage

The Project will result in the removal of waterways and wetlands however, the impact to fish passage will be localised, and due to the poor-quality fish habitat and fish passage values of the waterways, there is unlikely to be a measurable impact to fisheries resources beyond the Project area. Nevertheless, the disturbance footprint would result in the permanent loss of 0.88 ha of waterways within the disturbance area, and restriction of fish passage to a further 1.45 ha of waterway upstream of the disturbance area. This equates to an impact to 2.33 ha of ground-truthed waterways providing for fish passage.

The waterways within the Project area include stream order 1, 2 and 3 waterways and are classified as low, moderate and high risk of adverse impacts to fish movements. Removal of the waterways within the disturbance area will remove waterways potentially providing for fish passage. However, based on the results of the field survey, the waterways that flow through the Project area are poorly defined, with poor habitat quality that are significantly disturbed by surrounding land use. No fish were recorded during the field surveys in any of the waterways within the disturbance area, including in the stream order 2/3 site (UW1T) when it held water.

Dams located upstream of the Project area will also become disconnected as a result of the removal of downstream reaches of waterways that are within the Project area. However, it is considered unlikely that the farm dams located on reaches upstream of the Project area connect to downstream reaches frequently or adequately enough to provide valuable fish passage, and the upstream dams are not considered important habitats that require fish passage.

The proposed Moura-Baralaba Road realignment that will be completed off-lease crosses two mapped low risk waterways. However, based on the August 2023 ground-truthing of the mapped waterways, there are no waterway characteristics present at any of the mapped features crossed by the road realignment, with the exception of Tributary 8. Impacts to fish passage on this waterway, if present, can be minimised and mitigated through appropriate culvert design and installation. Waterway barrier works are not likely to be required for construction of the ETL.

Overall, connectivity through the waterways and wetlands within and upstream of the Project area is currently very limited due to the ephemeral nature of the area, the lack of defined waterway channels within the flat floodplain habitat (which has been extensively modified for agricultural purposes) and existing waterway barriers including farm dams. Based on the field survey results, there are no important aquatic breeding, feeding or refuge areas to consider. Species that are found within the disturbance area (and any species that may potentially occur in the farm dams upstream of the Project area) are common within the region and resilient and have likely established self-sustaining communities that are not reliant on connections through the Project area to other waterways.

#### *Avoidance, mitigation and management*

Impacts to waterways providing for fish passage cannot be avoided due to the location of the coal seam. Impacts will be partially mitigated through the design of waterway crossings in consideration of the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018) to ensure that fish passage is maintained.

The Project will ensure that ground disturbance along the south-western boundary of the development footprint is managed to avoid disturbance of the main channel of Tributary 8.

The Project will provide a diversion drain (drainage feature) around the north-west of the disturbance area to maintain connectivity along Tributary 8 in this location that is consistent with pre-mining conditions.

#### *Significant impact assessment*

Ground-truthing confirmed that approximately 2.33 ha of waterways providing for fish passage will be permanently impacted within and upstream of the disturbance area, and this constitutes an SRI in accordance with the SRI Guidelines.

Table 7.31 provides an assessment of the significance of impact to the waterways providing fish passage against the Queensland SRI Guideline for protected wildlife habitat.

Table 7.31: Assessment of significance of residual impacts for waterways providing fish passage

Significant impact criteria	Assessment of significance
<i>An action is likely to have a significant impact on a waterway providing for fish passage if there is a real possibility that it will:</i>	
<ul style="list-style-type: none"> <li>result in the mortality or injury of fish; or</li> </ul>	<p>Removal of waterways within the disturbance footprint may result in the mortality of fish, though it is noted that the waterways are dry for most of the year and therefore do not support fish for most of the year, nor significant fish populations when they hold water.</p>
<ul style="list-style-type: none"> <li>result in conditions that substantially increase risks to the health, wellbeing and productivity of fish seeking passage such as through the depletion of fishes energy reserves, stranding, increased predation risks, entrapment or confined schooling behaviour in fish; or</li> </ul>	<p>Removal of waterways within the disturbance footprint will prevent the passage of fish upstream. This will be partly mitigated by a diversion drain, designed to facilitate fish passage, in the north-west of the disturbance footprint. Waterways will be permanently lost within the southern portion of the disturbance footprint.</p>
<ul style="list-style-type: none"> <li>reduce the extent, frequency or duration of fish passage previously found at a site; or</li> </ul>	<p>Removal of waterways within the disturbance footprint will reduce the extent, frequency or duration of fish passage previously found within the Project area (noting that the extent, frequency, and duration of fish passage that currently occurs is minimal due to the ill-defined and highly ephemeral nature of the waterways within the disturbance footprint).</p>
<ul style="list-style-type: none"> <li>substantially modify, destroy or fragment areas of fish habitat (including, but not limited to instream vegetation, snags and woody debris, substrate, bank or riffle formations) necessary for the breeding and/or survival of fish; or</li> </ul>	<p>Removal of waterways within the disturbance footprint will destroy and fragment areas of fish habitat within the Project area. It is noted that the quality of fish habitat provided by the waterways on the site is poor. There are no substantial areas of instream vegetation, snags and woody debris, substrate, bank, or riffle formations within the proposed disturbance area.</p>
<ul style="list-style-type: none"> <li>result in a substantial and measurable change in the hydrological regime of the waterway, for example, a substantial change to the volume, depth, timing, duration and frequency of flows; or</li> </ul>	<p>The loss of catchment area is expected to result in a moderate reduction in flows for the minor waterways that will remain within and immediately downstream of the Project area (Engeny Water Management 2023a). The downstream reach of the north-western waterway (Shirley's Gully) is of moderate aquatic ecological value and will experience a reduction in flow from the loss of upstream catchment. This will result in an overall minor (localised) impact to the aquatic ecosystem, noting that conditions in the reaches upstream of the Neville Hewitt Weir pool are not expected to be significantly different than those that occur in many of the ephemeral waterways of the region, with this habitat still available to aquatic flora and fauna during times of flow. The lower reaches of the gully are within the Neville Hewitt Weir pool and provide refuge habitat for aquatic flora and fauna; this will not change as a result of the loss of catchment area as water here backs up from the Dawson River. No measurable change in the hydrological regime of Banana Creek or the Dawson River is predicted.</p>
<ul style="list-style-type: none"> <li>lead to significant changes in water quality parameters such as temperature, dissolved oxygen, pH and conductivity that provide cues for movement in local fish species.</li> </ul>	<p>No significant changes in the water quality of minor waterways are predicted. No significant impacts to the water quality of the Dawson River are predicted as a result of planned releases of MAW.</p>

Significant impact criteria	Assessment of significance
<b>Conclusion</b>	Impacts will be partially mitigated through the design of waterway crossings and diversions, however, it is considered likely that the Project will have significant residual impact to 2.33 ha of waterways providing for fish passage.

## 7.11 Proposed biodiversity offsets

Following State and Australian Government approval of the Project, including consideration and endorsement of the Biodiversity Offset Strategy (Appendix J), the following steps will be completed:

- in consultation with relevant stakeholders select properties that can fulfil offset supply requirements;
- prepare an Offset Management Plan for each applicable offset supply property;
- legally secure offset supply area/s; and
- prepare an Offset Delivery Plan for approval prior to commencement of the Project.

Offset strategies specific to MNES and MSES are outlined in the following sections.

The Biodiversity Offset Strategy provides a comprehensive assessment of EPBC offset requirements and the proposed delivery strategy (Appendix J, Biodiversity Offsets Strategy).

### 7.11.1 MNES offset requirements

A summary of MNES offset requirements and the delivery strategy is further detailed in Chapter 9, MNES. Based on the results of the significant impact assessments (section 7.10.1), it is proposed that the Proponent should provide biodiversity offsets for the MNES outlined in Table 7.32.

Table 7.32: MNES to be offset

Protected attribute description	Quantum of impact	
<b><i>Xerothamnella herbacea</i></b>		
This species was recorded in 10 locations within a fragmented and considerably degraded patch of regrowth vegetation in the central eastern portion of the Project disturbance footprint.  The number of individuals present at each location was low and ranged from one individual to around 20 individuals.	Quantum of impact (number of individuals)	90
<b>Ornamental Snake</b>		
The Project disturbance footprint Ornamental Snake habitat in the form of:	Area (ha)	34.9
	Quality (scale 0-10)	4

Protected attribute description	Quantum of impact	
<ul style="list-style-type: none"> <li>• drainage lines with fringing vegetation and some fallen timber</li> <li>• gilgai and wetland habitat (with or without vegetation or fallen timber)</li> <li>• marginal gilgai habitat (without vegetation or fallen timber).</li> </ul> <p>These habitats were found to vary in condition based on the history of disturbance (i.e. vegetation clearing, blade ploughing, cattle grazing, weed invasion), presence, depth and condition of gilgai, and abundance of fallen timber.</p>	Total quantum of impact (adjusted ha)	17.45

The two MNES that are proposed to be offset are considered to result in the same or substantially the same impact as a corresponding MSES. Therefore, to avoid any duplication between offset conditions at the State and Commonwealth level, the offset policy hierarchy will be applied and the requirement for an offset will be satisfied for such dual listed matters under the Commonwealth offset regime.

Given the requirement for a minimum of 90% of Commonwealth offset conditions to be carried out by way of a land-based offset, the primary objective is to deliver a proponent-driven, land-based offset by securing suitable land capable of fulfilling both Commonwealth and State offset requirements.

Six properties have been identified that support the required offsetable values (Figure 7.35). Comprehensive field surveys and habitat quality scoring were undertaken to determine the presence and quality of each of the MNES and MSES requiring offsets within each of the properties. As far as practicable, it has been the Proponent's intention to co-locate offsets for each matter significantly impacted by the Project within the same offset property. However, all ecological values requiring offsetting must occur within one or more of the properties investigated. Table 7.33 specifies the potential presence of each matter within the target properties.

Table 7.33: Comparison of MNES on each offset investigation area

Significantly impacted matter	Offset investigation area					
	Property A	Property B	Property C	Property D	Property E	Property F
<i>Xerothamnella herbacea</i>	Not present	Not present	Not present	Not present	Not present	Present
Ornamental Snake habitat	Present	Present	Present	Present	Present	Present

Analysis has identified that ample opportunity exists to locate all potential offset supply within target properties. The percentage of the offset requirement for each of the values requiring offsetting was assessed using the EPBC Act offset calculator and field data. Table 7.34 specifies the potential offset supply areas available for each matter within the target properties.

Table 7.34: Percentage of total offset requirement for each MNES to be significantly impacted within each offset property

Significantly impacted matter	Offset investigation area					
	Property A	Property B	Property C	Property D	Property E	Property F
<i>Xerothamnella herbacea</i>	-	-	-	-	-	2,079.0%

Significantly impacted matter	Offset investigation area					
	Property A	Property B	Property C	Property D	Property E	Property F
Ornamental Snake habitat	487.14%	73.32%	Not considered	Not considered	509.81%	Not considered

### 7.11.2 MSES offset requirements

Offsets will also be required under the EO Act and the Queensland Environmental Offsets Policy (QEOP). Based on the results of the significant residual impact assessments (section 7.10.2), it is proposed that the Proponent provide biodiversity offsets for MSES matters as outlined in Table 7.35.

Table 7.35: MSES matters to be offset

MSES matter	Area impacted by the Project (ha)
Connectivity areas	10.1
Waterways providing fish passage	2.33 (2.21 unmitigated by the Project)

Under the QEOP, there are three offset delivery options, which include:

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

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

$$\text{Offset Area} = \text{Area of Impact} \times \text{Multiplier}$$

It was determined however, that the Project presents potential for significant impacts to landscape connectivity. The LFC Tool determined there would be significant local impact to connectivity. Therefore, impacts to 10.1 ha of remnant vegetation within the Project area will require offsets in accordance with the EO Act and Environmental Offsets Policy. In accordance with the Environmental Offsets Policy for connectivity impacts, the offset site must be a non-remnant ecosystem and in the same sub-region as the impact area. Under this policy the offset multiplier for connectivity impacts is ‘1’ (DES, 2020).



The Biodiversity Offset Strategy identifies a number of properties comprising large areas of regrowth and regenerating Brigalow woodland (REs 11.3.1, 11.4.9a and 11.9.1) and Silver-leaved Ironbark (*Eucalyptus melanophloia*) woodland (RE 11.5.5c), within which an offset site(s) is proposed to be established to offset impacts to Ornamental Snake habitat. These areas account for approximately 263 ha and it is proposed the non-remnant regenerating areas that are contained within the MNES offset areas will also provide offsets for Project impacts to 10.1 ha of connectivity areas under the EO Act. The Proponent may alternatively provide a financial contribution for the provision of some MSES, in place of land-based offsets, in accordance with Queensland policy.

Additionally, there will be an SRI to 2.33 ha of ground-truthed waterways providing for fish passage. This will be partially mitigated by the construction of a diversion drain that provides for fish passage in the north-western part of the footprint (0.12 ha), while the remainder (2.21 ha) may be offset with a financial offset payment.

The QEOP financial settlement offset calculator was utilised to estimate a total financial settlement payment for the connectivity area and waterways providing for fish passage that will be significantly impacted by the Project. Based on the calculation, the Proponent would be required to make an estimated total payment of \$144,600.00 (DES, 2023).

Table 7.36 provides a summary of the inputs used in the QEOP financial settlement offset calculation.

Table 7.36: Sections, areas and matter groups used in financial settlement offset calculator

Section	Bioregion / Marine (and waterways) zone	Sub-region / Marine bioregion	Local government area (LGA)	Distinct matter area (DMA)	DMA impact area (ha)	DMA notional offset area (ha)	Matter group
1	Brigalow Belt	Dawson River Downs	Banana Shire Council	1.1	10.1	10.1	1.1.1 Connectivity
2	Rivers and inland waterways	Inland Waterways	-	2.1	2.21	2.21	2.1.1 Fish passage



- Legend**
- Potential offset sites
  - Project Site (MLA 700057)

**Baralaba South Project  
Biodiversity Offset Strategy**

Map Number: 20044\_BOS2\_05\_C  
 Date: 13 April 2021  
 Map Projection: GDA2020 MGA Zone 56  
 Imagery: Digital Globe  
 Data: Roads, DCDB - (c)DNRM 2021

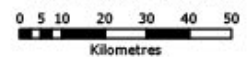


Figure 7.35: Location of potential offset properties