# SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

## Appendix D-1
Aquatic Ecology Technical Report

BHP

# Saraji East Mining Lease Project
# Environmental Impact Statement

## Aquatic Ecology Assessment

*Prepared for:*

**AECOM on behalf of BMA**

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## Summary

frc environmental was commissioned by AECOM, on behalf of BM Alliance Coal Operations Pty Ltd (BMA), to assess the potential impact of the proposed Saraji East Mining Lease Project (the Project) on aquatic ecological values, in support of the Environmental Impact Statement for the Project.

The Project comprises a greenfield single-seam underground mine development on Mining Lease Area (MLA) 70383 commencing from within Mining Lease (ML) 1775. Transportation (e.g. conveyor network and rail loop) and operating infrastructure (e.g. Coal Handling Preparation Plant (CHPP) and Mine Infrastructure Area (MIA)) are also key aspects of the Project.

The scope of this aquatic ecology study is to:

- describe the aquatic Environmental Values of watercourses and sensitive aquatic environmental receptors in and surrounding the Project Site;
- identify potential sources of adverse ecological impacts from the Project on the Environmental Values of watercourses in, and surrounding, the Project Site; and
- perform an ecological impact assessment for the Project.

A desktop approach was used to provide a description of the aquatic ecology and aquatic Environmental Values in, and surrounding, the Project Site. This included a review of:

- aquatic Matters of National Environmental Significance (MNES) under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act);
- aquatic Matters of State Environmental Significance (MSES), which are biodiversity matters of interest to the State Government of Queensland under the State Planning Policy;
- mapped aquatic ecological features, including floodplains, wetlands and surface-expression groundwater dependent ecosystems;
- publically available hydrological data from the Department of Natural Resources, Mines and Energy (DNRME) gauging station 130410A on the Isaac River at Deverill;
- relevant literature, including published and unpublished technical reports, scientific papers, and conservation advice statements for any MNES identified;

- the aquatic ecology baseline studies completed in December 2007 and April 2010; and
- data contained in frc environmental's in-house bio-physical database.

The assessment of impacts comprised :

- a risk-based assessment, with the level of risk being an outcome of the consequence and likelihood of the potential impact; and
- specific assessment of potential impacts to aquatic MNES using the Significant Impact Guidelines 1.1.

The following aquatic MNES were listed as potentially occurring in and surrounding the Project Site:

- white-throated snapping turtle (*Elseya albagula*) (critically endangered); and
- Fitzroy River turtle (*Rheodytes leukops*) (vulnerable).

The following potential sources of impact to aquatic Environmental Values associated with the Project were identified:

- subsidence;
- unplanned discharge of mine-affected water to watercourses;
- watercourse crossings;
- vegetation clearing and earthworks; and
- operation and maintenance of vehicles and other equipment.

The consequence from each source of impact was assessed as moderate, however the likelihood of impact was low where the identified mitigations were applied. Therefore, there was low risk of adverse impact to the aquatic Environmental Values of watercourses in and surrounding the Project Site.

The two identified aquatic MNES (i.e. white-throated snapping turtle and Fitzroy River turtle) are sufficiently remote as to have no risk of impact from the Project.

# 1 Introduction

frc environmental was commissioned by AECOM, on behalf of BM Alliance Coal Operations Pty Ltd (BMA) to assess the potential impacts of the proposed Saraji East Mining Lease Project (the Project) on aquatic ecological values, in support of the Environmental Impact Statement for the Project.

The Project comprises a greenfield single-seam underground mine development on Mining Lease Area (MLA) 70383 commencing from within Mining Lease (ML) 1775. Transportation (e.g. conveyor network and rail loop) and operating infrastructure (e.g. Coal Handling Preparation Plant (CHPP) and Mine Infrastructure Area (MIA)) are also key aspects of the Project.

## 1.1 Scope of Assessment

The scope of this aquatic ecology study is to:

- describe the aquatic Environmental Values of watercourses and sensitive aquatic environmental receptors in and surrounding the Project Site;
- identify potential sources of adverse ecological impacts from the Project on the Environmental Values of watercourses in, and surrounding, the Project Site; and
- perform an ecological impact assessment for the Project using a risk-based approach to impact assessment and the Significant Impact Guidelines for any identified aquatic Matter of National Environmental Significance (MNES).

# 2 Legislation and Policy

## 2.1 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides the legal framework for the protection and management of nationally and internationally threatened flora and fauna (including migratory species), ecological communities, internationally important wetlands, heritage places, the Great Barrier Reef, and Commonwealth marine areas, which are collectively defined as Matters of National Environmental Significance (MNES). Water resources and nuclear actions are also regulated under the EPBC Act.

The EPBC Act provides protection for threatened flora, fauna and ecological communities by:

- identifying and listing species and ecological communities as threatened;
- developing conservation advice and recovery plans for listed species and ecological communities;
- developing a register of critical habitat;
- recognising key threatening processes; and
- where appropriate, reducing the impacts of these processes through threat abatement plans and non-statutory threat abatement advices.

A total of 36 freshwater fish species and seven freshwater turtle species[1] are listed as threatened under the EPBC Act.

The EPBC Act provides guidance on whether an action (e.g. a proposed development) is likely to have a significant impact on a MNES. Significant Impact Guidelines 1.1 (DoEE 2013) provide guidance, in the form of assessment criteria, in relation to significant impacts on threatened species under the EPBC Act.

An action is likely to have a significant impact on a threatened species if there is a real chance or possibility that it will:

[1] EPBC Act list of threatened fauna (http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl#fishes_extinct_in_the_wild); viewed 29 March 2018.

- lead to a long-term decrease in the size of a population (important population for vulnerable species);
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; and/or
- interfere with the recovery of the species.

Where an assessment identifies that an action will have a significant impact on a threatened species, the action will be deemed a 'controlled' action and require appropriate environmental assessment within the approval application process. If approved, controlled actions typically have approval conditions that mitigate any potential impacts to MNES.

The Project was referred under the EPBC Act on 5 October 2016. On 18 October 2016, the Department of Energy and Environment (DoEE) deemed the Project a controlled action based on the potential for a significant impact to the following controlling provisions:

- Listed threatened species and communities (sections 18 & 18A); and
- A water resource, in relation to coal seam gas development and large coal mining development (sections 240 & 24E).

## 2.2 Queensland *Environmental Protection Act 1994*

The Queensland *Environmental Protection Act 1994* (EP Act) provides the legislative framework for ecologically sustainable development in Queensland, requiring people, companies and government to take all reasonable and practical steps to avoid harm to the environment.

The EP Act and its subordinate legislation provides a range of mechanisms designed to achieve the objectives of the EP Act. With respect to inland waters, the EP Act requires:

- identification of Environmental Values and management goals for Queensland waters;
- stating water quality guidelines and water quality objectives to enhance or protect the identified Environmental Values;
- providing a framework for decision making about Queensland waters; and
- monitoring and reporting the condition of Queensland waters.

The Environmental Protection Regulation 2008, pursuant to the EP Act, specifies Environmentally Relevant Activities (ERAs) that are known to have the potential to cause environmental harm, and so require a comprehensive Environmental Impact Statement (EIS) or Impact Assessment Report (IAR) to be prepared as part of the development application process[2]. Resource developments, including coal mines, are ERAs listed under the Environmental Protection Regulation 2008.

Environmental Values for Queensland waters are presented in the Environmental Protection (Water) Policy 2009, and include aquatic ecosystem protection amongst other values for water (e.g. drinking water, recreation, agricultural uses, industrial uses). The aquatic ecosystem Environmental Value is defined on the basis of a range of ecohydrological attributes, including, but not limited to, Matters of State Environmental Significance (MSES) prescribed in the State Planning Policy. MSES include:

- state conservation areas (e.g. National Parks);
- wetlands and waterways;
- threatened species;
- regulated areas
- fish habitat areas; and
- offset areas.

[2] Other large projects that might not be ERAs, but are complex, and have potential for significant environmental impacts, strategic significance to the economy and/or significant infrastructure requirements may be declared 'coordinated projects' under the *State Development and Public Works Organisation Act 1971* (Qld); these projects also require an EIS or IAR (based on the framework of the EP Act) to be prepared within the scope of their approvals process.

## 2.3 Queensland *Nature Conservation Act 1992*

The *Nature Conservation Act 1992* (NC Act) provides for the conservation of Queensland's nature by declaring and managing a protected area network, protecting threatened species (wildlife) and their habitats, regulating the taking of wildlife, and co-ordinating nature conservation with Traditional Owners and other land owners. Several freshwater species are protected wildlife under the NC Act.

Protected wildlife listed under the NC Act must be protected from threatening processes, and critical habitat for protected wildlife is required to be protected to the greatest extent possible. Depending on the type of proposed development, wildlife and their habitats protected under the NC Act are assessed through either the EIS framework of the EP Act (for ERAs or coordinated actions) or the assessment framework of the *Planning Act 2016* (for other development types).

## 2.4 Queensland *Vegetation Management Act 1999*

The *Vegetation Management Act 1999* (VM Act) regulates the clearing of vegetation to conserve threatened regional ecosystems, protect biodiversity and maintain ecological processes, amongst other purposes.

The VM Act provides for the Department of Natural Resources, Mines and Energy Chief Executive to certify various classes of regulated vegetation maps, with regulated vegetation a MSES. Two classes of regulated vegetation pertain to aquatic ecosystems: (1) vegetation intersecting watercourses; and (2) drainage features [3] and wetland vegetation. These regulated vegetation types, as MSES, contribute to the Environmental Values of waterways and wetlands, and should therefore be considered within the assessment framework (e.g. EIS) of the EP Act.

## 2.5 Queensland *Fisheries Act 1994*

The *Fisheries Act 1994* provides for the management and protection of fisheries resources, including regulating fishing and aquaculture, and regulating development that might impact declared fish habitat areas, fish passage in waterways and marine plants. Several fish species of special interest are listed as 'no take' species under the *Fisheries Act 1994*, including Australian lungfish.

[3] Watercourse and drainage feature are both defined in the *Water Act 2000* (Qld).

Fisheries resources, including fish habitat areas which are MSES, contribute to the Environmental Values of waterways and wetlands, and are therefore be considered within the assessment framework (e.g. EIS) of the EP Act.

# 3 Methodology

## 3.1 Desktop Approach

A desktop approach was used to provide a description of the aquatic ecology and aquatic Environmental Values in, and surrounding, the Project Site. This included review of:

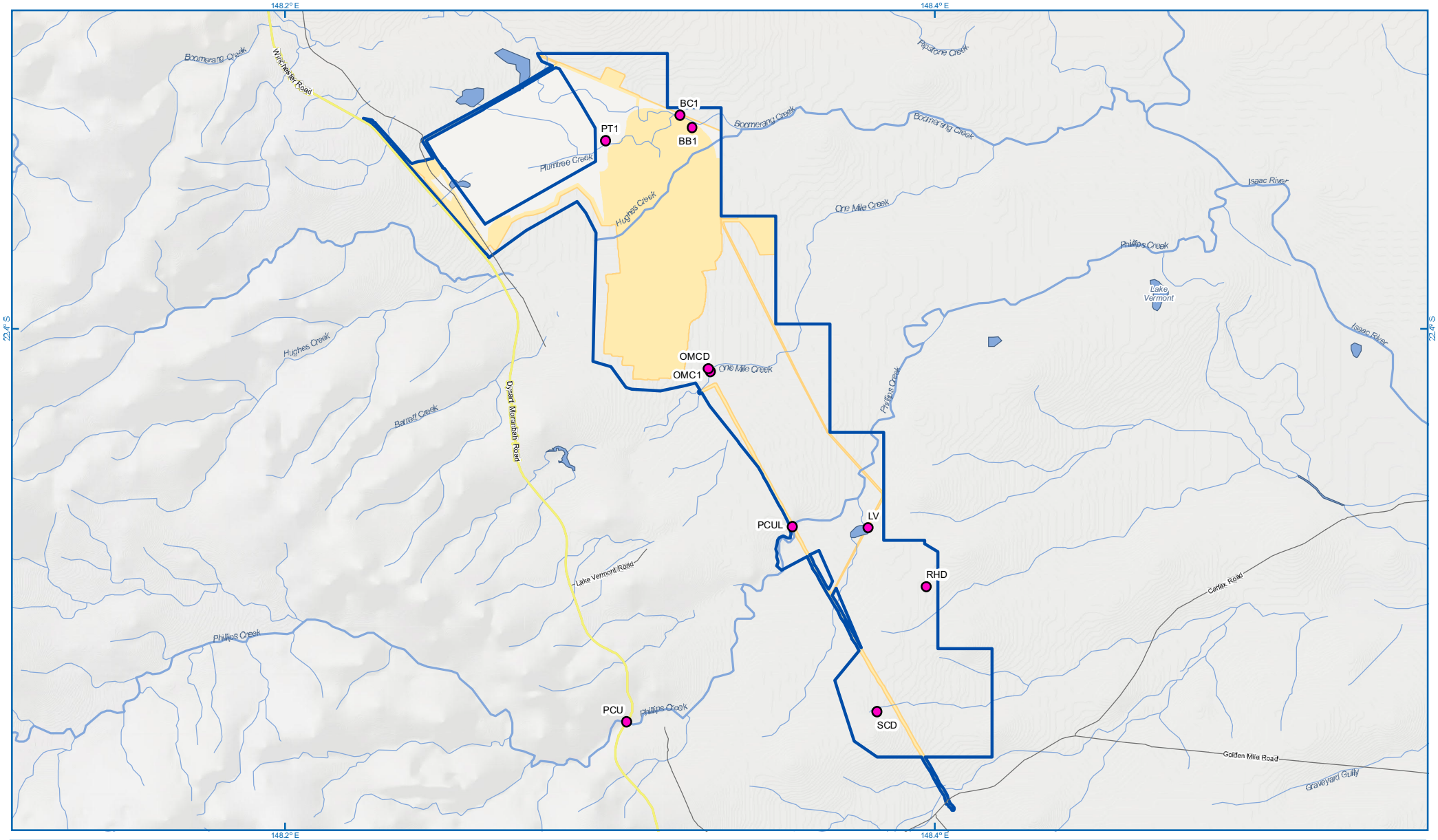
- aquatic MNES under the EPBC Act;
- aquatic MSES, which are biodiversity matters of interest to the Queensland Government under the State Planning Policy. The MSES of interest for this study are likely to be:
  - threatened freshwater species under the NC Act, supported by a search of Queensland's Wildlife Online database;
  - wetland protection areas as shown on the map of Referable Wetlands under the Environmental Protection Regulation 2008;
  - High Ecological Value waters as defined under the Environmental Protection (Water) Policy 2009; and
  - freshwater-dependent regulated vegetation, listed under the VM Act.
- features that support fisheries recourses, pursuant to the *Fisheries Act 1994;*
- mapped aquatic ecological features, including floodplains, wetlands and surface-expression ground-water dependent ecosystems;
- publically available hydrological data for Department of Natural Resources, Mines and Energy (DNRME) gauging station 130410A on the Isaac River at Deverill;
- relevant literature, including published and unpublished technical reports, scientific papers, and conservation advice statements for any MNES identified, including:
  - DoEE online EPBC Act Protected Matters Search Tool;
  - Queensland's Department of Environment and Science (DES) Wildlife Online database;
  - DoEE's species profile and threats database;
  - DoEE conservation advice for the identified aquatic MNES; and
  - published scientific literature.

- the aquatic ecology baseline studies completed in December 2007 and April 2010 (SKM 2011), with survey site locations shown in Table 3.1 and Map 3.1, and survey methods presented in Appendix A; and
- data contained in frc environmental's in-house bio-physical database.

Table 3.1 Survey sites for the aquatic ecology baseline studies

| Site Name | Description | Latitude [a] | Longitude [a] |
|---|---|---|---|
| PCU | Phillips Creek Upstream | -22.520 | 148.305 |
| PCUL | Phillips Creek Upstream of Lease | -22.461 | 148.356 |
| PT1 | Plumtree Creek 1 | -22.342 | 148.299 |
| RHD | Railway Head Dam | -22.479 | 148.398 |
| SCD | Southern Creek Dam | -22.517 | 148.382 |
| BB1 | Boomerang Billabong 1 | -22.338 | 148.325 |
| BC1 | Boomerang Creek 1 | -22.334 | 148.322 |
| LV | Lake Vermont | -22.461 | 148.380 |
| OMC1 | One Mile Creek | -22.413 | 148.331 |
| OMCD | One Mile Creek Dam | -22.412 | 148.330 |

[a] GDA 94

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Map 3.1:
Project Area and Survey Sites for the Aquatic Ecology Baseline Studies

**SOURCES**

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**LEGEND**

- Survey Sites
- Project Footprint
- Project Site
- Major Watercourse
- Minor Watercourse
- Lake/Reservoir

**Road Network**

- Main Road
- Local Road

N

**SCALE**

0 0.5 1 2 3 4 5
Kilometres

Scale: 1:120,000 @ A3

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Datum: GDA 1994
Units: Degree

**DATE**
2018-09-05

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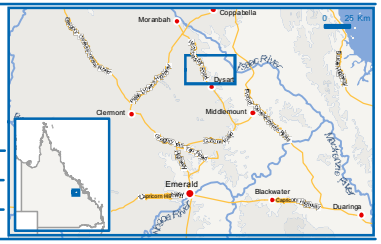


## 3.2 Assessment of Environmental Values

The aquatic Environmental Values in and surrounding the Project Site were assessed using the criteria in Table 3.2. In-stream and riparian areas were assessed separately.

Table 3.2 Criteria used to assess environmental value of each site

| Aquatic Ecological Value | Criteria/Description |
|---|---|
| High | Known or likely occurrence of aquatic MNES and/or aquatic MSES |
| Moderate | Aquatic MNES and MSES unlikely to occur, however suitable habitat for non-listed aquatic species of turtles and fish is present |
| Low | Ephemeral watercourse without refugial pools; limited aquatic habitat features present; likely to provide low quality habitat for non-listed aquatic species during high flow events only. |

## 3.3 Impact Assessment

The assessment of impacts comprised:

- a risk-based assessment, with the level of risk being an outcome of the consequence and likelihood of the potential impact (refer to Table 3.3 to Table 3.5); and
- specific assessment of potential impacts to aquatic MNES using the Significant Impact Guidelines 1.1 (DoEE 2013).

To determine the applicable aquatic MNES species and ecological communities, the EPBC Protected Matters database was searched on 14 September 2016 (Appendix B) and the following aquatic MNES were listed as potentially occurring in, and surrounding, the Project Site:

- white-throated snapping turtle (*Elseya albagula*) (critically endangered); and
- Fitzroy River turtle (*Rheodytes leukops*) (vulnerable).

All other MNES that the EPBC search identified were considered to be outside the scope of this study (i.e. not aquatic species).

Table 3.3 Ratings used to assess the likelihood of potential impacts

| Rating | Likelihood of potential impacts |
|---|---|
| High | Almost certain or high likelihood of the impact occurring; has occurred recently in a similar scenario; likely to happen commonly. |
| Moderate | Likely or probably could happen; would not happen very commonly. |
| Low | Possible but unlikely to happen; would happen rarely if at all. |

Table 3.4 Ratings used to assess the consequence of potential impacts

| Rating | Consequence of potential impacts |
|---|---|
| High | Catastrophic, irreversible or critical long term environmental harm or loss; significant harm or loss of sensitive components of the environment; significant harm or loss of protected components of the environment, such as protected wetlands or MNES. |
| Moderate | Significant short-term but reversible harm of sensitive components of the environment; minor environmental harm to protected components of the environment, such as protected wetlands or MNES. |
| Low | Unfavourable impact with no lasting harm to the environment, excluding sensitive and protected components of the environment. |

Table 3.5 Environmental risk matrix

| | | **Likelihood** | | |
|---|---|---|---|---|
| | | **Low** | **Moderate** | **High** |
| **Consequence** | **High** | Moderate | High | High |
| | **Moderate** | Low | Moderate | High |
| | **Low** | Low | Low | Moderate |

# 4 Environmental Values of Watercourses

## 4.1 Aquatic Matters of National Environmental Significance

### White-Throated Snapping Turtle

The white-throated snapping turtle (*Elseya albagula*) is listed as critically endangered under the EPBC Act and endangered under the NC Act. This species is restricted to the Fitzroy, Burnett and Mary Basins, and adjacent coastal basins (e.g. Kolan and Gregory-Burrum systems) (Hamann et al. 2007). This species is a habitat specialist, preferring permanent, flowing, clear and well oxygenated water with moderate to high cover of aquatic habitat (i.e. large woody debris and undercut banks) (Todd et al. 2013). Within the greater Fitzroy, Burnett and Mary river catchments, this species has been recorded almost exclusively in close association with permanent flowing stream reaches that are typically characterised by a sand-gravel substrate with submerged rock crevices, undercut banks and/or submerged logs and fallen trees (Hamann et al. 2007). A full description of white-throated snapping turtle is presented in Appendix C.

The nearest confirmed record of white-throated snapping turtle (Connor River north of Lotus Creek, Atlas of Living Australia 2018) is over 80 kilometres (km) (straight-line distance) from the Project Site, and the Queensland Wildlife Online database does not have any records of this species within 50 km of the Project Site. The absence of records of white-throated snapping turtle from the Project Site and surrounds (and the wider Isaac River Sub-basin) is consistent with the reported habitat preferences of the species (i.e. permanent, flowing water).

It is considered that the nearest likely population of white-throated snapping turtle is near the confluence of the Isaac River and Connors River, some 70 km (straight-line distance) downstream from the Project Site, where there are permanent pools and flows are more regular (i.e. flows occur 80% of the time in the Connors River at Pink Lagoon (gauging station 130404A) compared to only 27% of the time in the Isaac River at Deverill (gauging station 130410A) (DNRME 2018)).

### Fitzroy River Turtle

The Fitzroy River turtle (*Rheodytes leukops*) is listed as vulnerable under the EPBC Act and vulnerable under the NC Act. This species is restricted to the Fitzroy River Basin (Threatened Species Scientific Committee 2008), where it occurs in permanent freshwater rivers from the Fitzroy Barrage to Theodore Weir and Duck Ponds, upstream of the Comet-Mackenzie River confluence, as well as through Marlborough Creek (Limpus et al. 2007). It has also been found in isolated permanent waterholes on the Connors River (Limpus et al. 2007; frc environmental 2010). However, the species is not known to inhabit small farm dams or ephemeral waterways (Limpus et al. 2007). A full description of Fitzroy River turtle is presented in Appendix D.

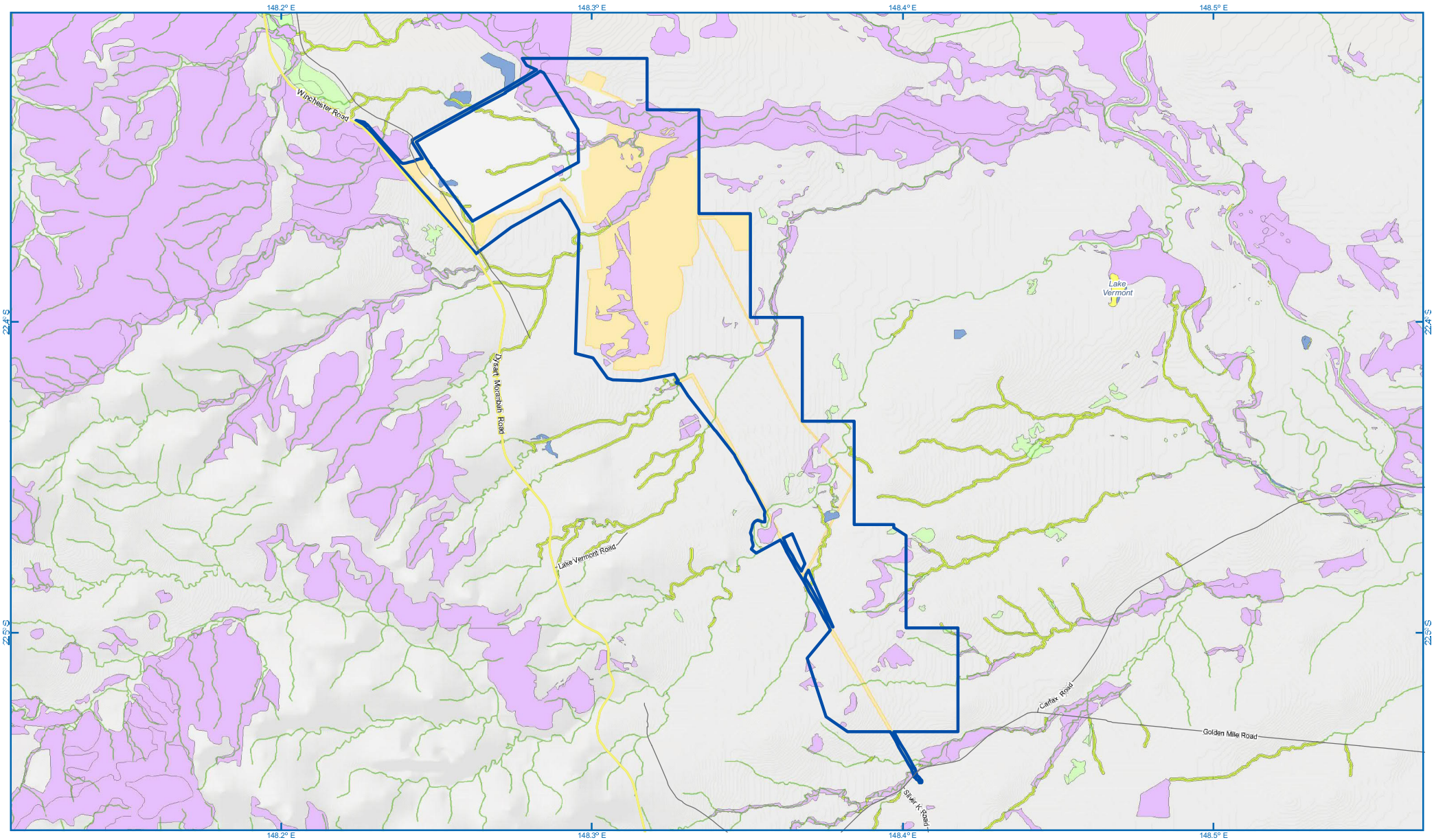
The nearest confirmed record of Fitzroy River turtle (Connors River near Lotus Creek, Atlas of Living Australia 2018) is over 90 km (straight-line distance) from the Project Site, and the Queensland Wildlife Online database does not have any records of this species within 50 km of the Project Site. The absence of records of Fitzroy River turtle from the Project Site (and the wider Isaac River Sub-basin) is consistent with the reported habitat preferences of the species (i.e. permanent water).

It is considered that the nearest likely population of Fitzroy River turtle is near the confluence of the Isaac River and Connors River, some 70 km (straight-line distance) downstream from the Project Site, where there are permanent pools and flows are more regular (i.e. flows occur 80% of the time in the Connors River at Pink Lagoon (gauging station 130404A) compared to only 27% of the time in the Isaac River at Deverill (gauging station 130410A) (DNRME 2018)).

## 4.2 Aquatic Matters of State Environmental Significance

Watercourses in and surrounding the Project Site range from stream order 6 (Boomerang Creek), stream order 5 (Phillips Creek) and stream order 3 (Plumtree, One Mile, Hughes and Barrett Creeks). The main stem of these watercourses is mapped as having major (purple; Boomerang and Phillips Creeks), high (red; One Mile, Hughes and Barret Creeks) and amber (moderate; Plumtree Creek) risk of impact to fish passage by waterway barrier works, (Map 4.2), indicating that the State of Queensland considers these watercourses to be important corridors for fish movement. Smaller upstream tributaries of these watercourses have low (green) risk of impact form waterway barrier works.

The riparian vegetation of watercourses in and surrounding the Project Site is mapped as regulated vegetation intersecting a watercourse (i.e. a MSES) (refer to Map 4.1). There are no other mapped aquatic MSES in or surrounding the Project Site (refer to Appendix E).

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## Map 4.1: Regulated Vegetation and High Ecological Value Waters

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**LEGEND**

- Project Site
- Project Footprint
- Regulated Vegetation (Intersecting a watercourse)
- Regulated Vegetation - Category B
- Regulated Vegetation - Category C
- Regulated Vegetation - Category R
- Lake/Reservoir

**Road Network**

- Main Road
- Local Road

N

**SCALE**

0 0.5 1 2 3 4 5
Kilometres

Scale: 1:125,000 @ A3

**PROJECTION**
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Units: Degree

**DATE**
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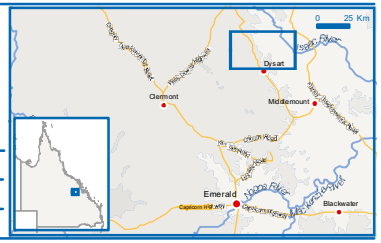

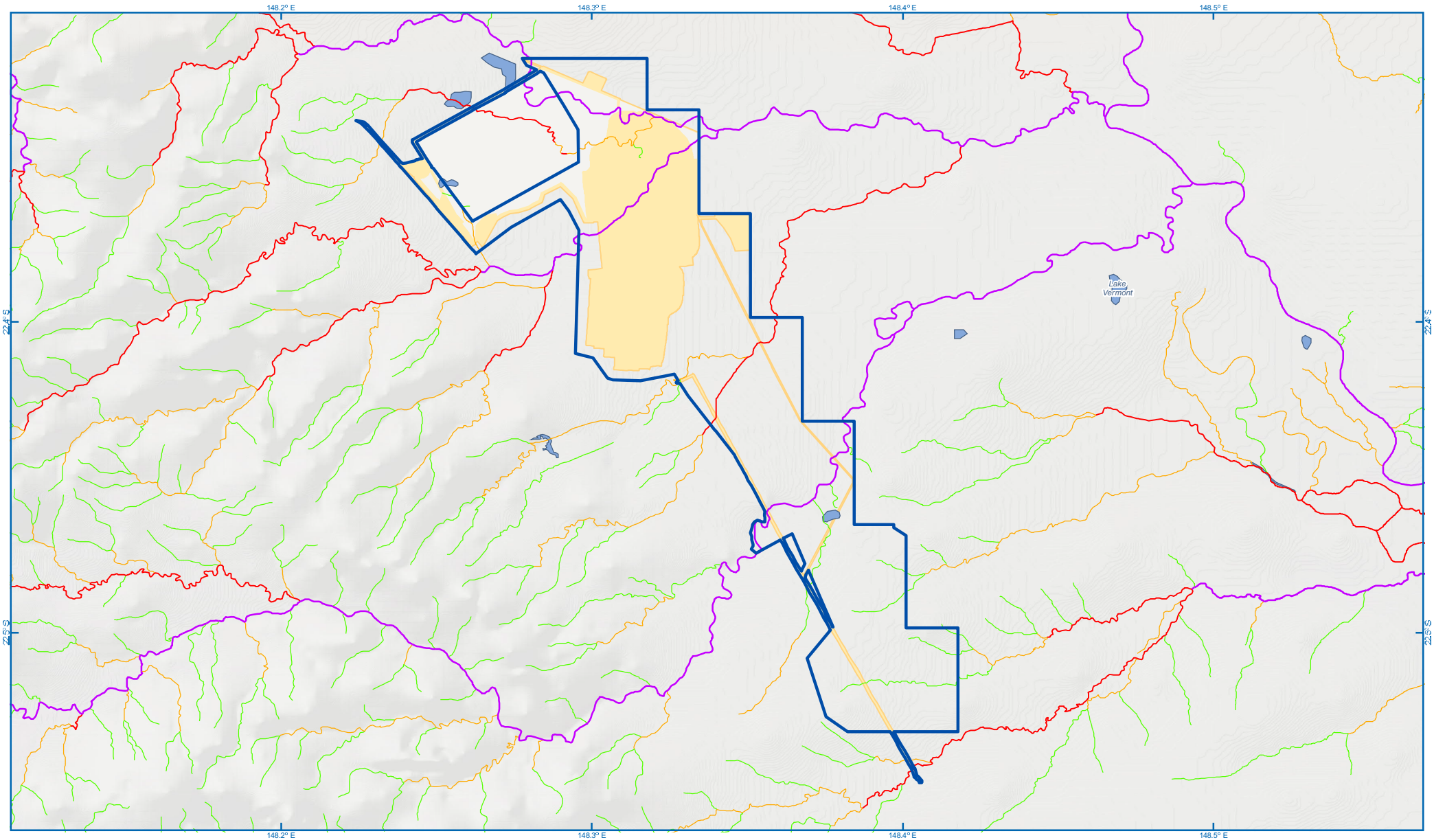


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## Map 4.2:
## Waterway Barrier Works Risk Layer

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**LEGEND**

- Project Site
- Project Footprint
- Lake/Reservoir

**Waterway Barrier Works - Stream Risk of Impact**

- Low
- Moderate
- High
- Major

N

**SCALE**

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Kilometres

Scale: 1:125,000 @ A3

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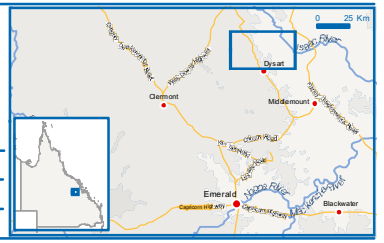


## 4.3 Water Quality

Water quality was measured in situ during the baseline aquatic ecology studies (SKM 2011). These results were compared to the regional Water Quality Objectives (WQOs) for moderately disturbed waters of western upland tributaries in the Isaac River Sub-basin (EHP 2013). The comparison found that (Table 4.1):

- turbidity was consistently higher than the WQO;
- dissolved oxygen was consistently lower than the WQO;
- electrical conductivity was higher than the WQO at several sites during the April 2010 survey[4]; and
- pH consistently complied with the WQO.

The baseline studies (SKM 2011) also reported preliminary data for blue-green algal counts for site One Mile Creek Dam (OMCD) from July 2009 to January 2010, showing high values (i.e. 380 cells/mL – 1260 cells/mL) and suggested that algal blooms may be an issue in the region.

Table 4.1 Water quality results for the baseline aquatic ecology surveys

| Site | Temp. (ºC) | Turbidity (NTU) | Dissolved oxygen (% saturation) | pH (unit) | Electrical cond. (µS/cm) |
|---|---|---|---|---|---|
| **WQO** | **–** | **50** | **85 – 110** | **6.5–8.5** | **720** [a] |
| April 2010 | | | | | |
| BB1 | 27 | 47 | 69 | 6.9 | 446 |
| BC1 | 29 | 100 | 68 | 7.6 | 656 |
| LV | 27 | 8 | 62 | 8.1 | 228 |
| OMC1 | 29 | 737 | 54 | 7.4 | 806 |
| OMCD | 27 | 9.3 | 42 | 7.5 | 251 |
| PCU | 27 | 8.5 | 53 | 7.5 | 1261 |
| PCUL | 31 | 96 | 49 | 7.8 | 680 |
| PT1 | 24 | 14 | 65 | 7.5 | 4922 |

[4] The hydrograph for the Isaac River (Figure 4.1) show no flows leading up to April 2010, suggesting that electrical conductivity may have increased due to accumulating salt concentrations in drying and contracting pools.

| Site | Temp. (ºC) | Turbidity (NTU) | Dissolved oxygen (% saturation) | pH (unit) | Electrical cond. (µS/cm) |
|---|---|---|---|---|---|
| **WQO** | **–** | **50** | **85 – 110** | **6.5–8.5** | **720** [a] |
| RHD | 32 | 79 | – | 8.1 | 226 |
| SCD | 29 | 30 | 32 | 7.5 | 280 |
| December 2007 | | | | | |
| PCU | 31.5 | >1000 | 75 | 7.02 | 177 |
| PCU-2 [b] | 23.7 | >1000 | 72 | 7.03 | 191.3 |
| PCUL | 28.7 | >1000 | 66 | 7.01 | 176.8 |
| LV | | 84 | 107 | 7.02 | 208.7 |
| Phillips Creek Middle | 30.8 | >1000 | 67 | 7 | 171 |
| Phillips Creek Flow | 23.4 | >1000 | 82 | 7.01 | 123.4 |
| OMCD | 30.12 | >1000 | 51 | 7 | 228 |
| OMC1 | 27.4 | >1000 | 36 | 7 | 18.3 |
| Unnamed gully | 36.9 | >1000 | 50 | 7 | 790 |

[a] baseflow WQO

[b] water quality was measured at two separate locations at this site on this survey

Water quality data collected between 1964 and 2017 at DNRME gauging station 130410A (Isaac River at Deverill) was also collated and compared to the regional WQOs to provide indicative water quality for a broader suite of parameters (Table 4.2). Results showed that:

- turbidity and total suspended solids were higher than the WQO;
- dissolved oxygen, electrical conductivity and pH generally complied with the WQO;
- nutrients were higher than the WQO; and
- copper was much higher than the WQO and zinc slightly higher than the WQO, with other metals complying with the WQO.

Table 4.2 Summary statistics for selected water quality parameters at DNRME gauging station 130410A

| Parameter | Unit | WQO | Count | Minimum | Median | Maximum |
|---|---|---|---|---|---|---|
| Conductivity | µS/cm | 720 [a] | 45 | 78.8 | 261 | 1470 |
| Turbidity | NTU | 50 | 15 | 4 | 63 | 5192 |
| Temperature (field) | ºC | – | 42 | 14 | 25.1 | 35.2 |
| pH | unit | 6.5–8.5 | 45 | 6.6 | 7.6 | 8.5 |
| Total Alkalinity (as $CaCO_3$) | mg/L | – | 45 | 22.13 | 78 | 192 |
| Hydroxide (as OH) | mg/L | – | 21 | 0 | 0 | 0.05 |
| Carbonate (as $CO_3$) | mg/L | – | 34 | 0 | 0.3 | 3.5 |
| Bicarbonate (as $HCO_3$) | mg/L | – | 45 | 26.96 | 95 | 231.3 |
| Hardness (as $CaCO_3$) | mg/L | – | 45 | 15.47 | 70 | 207 |
| Total Dissolved Solids | mg/L | – | 43 | 47.41 | 155 | 842 |
| Total Dissolved Ions | mg/L | – | 45 | 55.11 | 188 | 950.4 |
| Total Suspended Solids | mg/L | 55 | 41 | 5 | 135 | 3605 |
| Calcium | mg/L | – | 45 | 3.4 | 16 | 42.1 |
| Chloride | mg/L | 0.003 | 45 | 3 | 32 | 294 |
| Magnesium | mg/L | – | 45 | 1.7 | 7.6 | 25 |
| Nitrate | mg/L | – | 30 | 0.3 | 1.4 | 18 |
| Total Nitrogen | mg/L | 0.5 | 6 | 0.27 | 0.755 | 1.8 |
| Organic Nitrogen | mg/L | 0.42 | 2 | 1.628 | 2.599 | 3.571 |
| Nitrate and nitrite | mg/L | – | 8 | 0.003 | 0.1295 | 0.629 |
| Ammonia | mg/L | 0.02 | 8 | 0.005 | 0.023 | 0.056 |
| Oxygen (Dissolved) | mg/L | [b] | 16 | 2.8 | 7.4 | 9.8 |
| Total Phosphorus | mg/L | 0.05 | 8 | 0.035 | 0.35 | 1.524 |
| Total Reactive Phosphorous | mg/L | 0.02 | 8 | 0.009 | 0.031 | 0.050 |
| Potassium | mg/L | – | 42 | 1.90 | 4.55 | 8.30 |
| Sodium | mg/L | – | 45 | 4 | 22 | 230.2 |
| Sulfate | mg/L | 25 | 38 | 1.45 | 10.85 | 117.70 |
| Aluminium | mg/L | 0.055 | 10 | 0.000 | 0.050 | 1.100 |
| Boron | mg/L | 0.37 | 17 | 0.000 | 0.060 | 0.100 |
| Copper | mg/L | 0.0014 | 12 | 0.0100 | 0.0300 | 0.0600 |

| Parameter | Unit | WQO | Count | Minimum | Median | Maximum |
|---|---|---|---|---|---|---|
| Fluoride | mg/L | – | 42 | 0.1 | 0.14 | 0.25 |
| Iron | mg/L | – | 13 | 0 | 0.06 | 1.7 |
| Manganese | mg/L | 1.9 | 9 | 0.0 | 0.01 | 0.01 |
| Zinc | mg/L | 0.008 | 10 | 0.000 | 0.010 | 0.020 |

[a] baseflow WQO

[b] dissolved oxygen WQO range is 85 – 110% saturation, which approximates 7 mg/L – 9 mg/L

– no guideline available

## 4.4 Aquatic Habitat and Natural Flow Regime

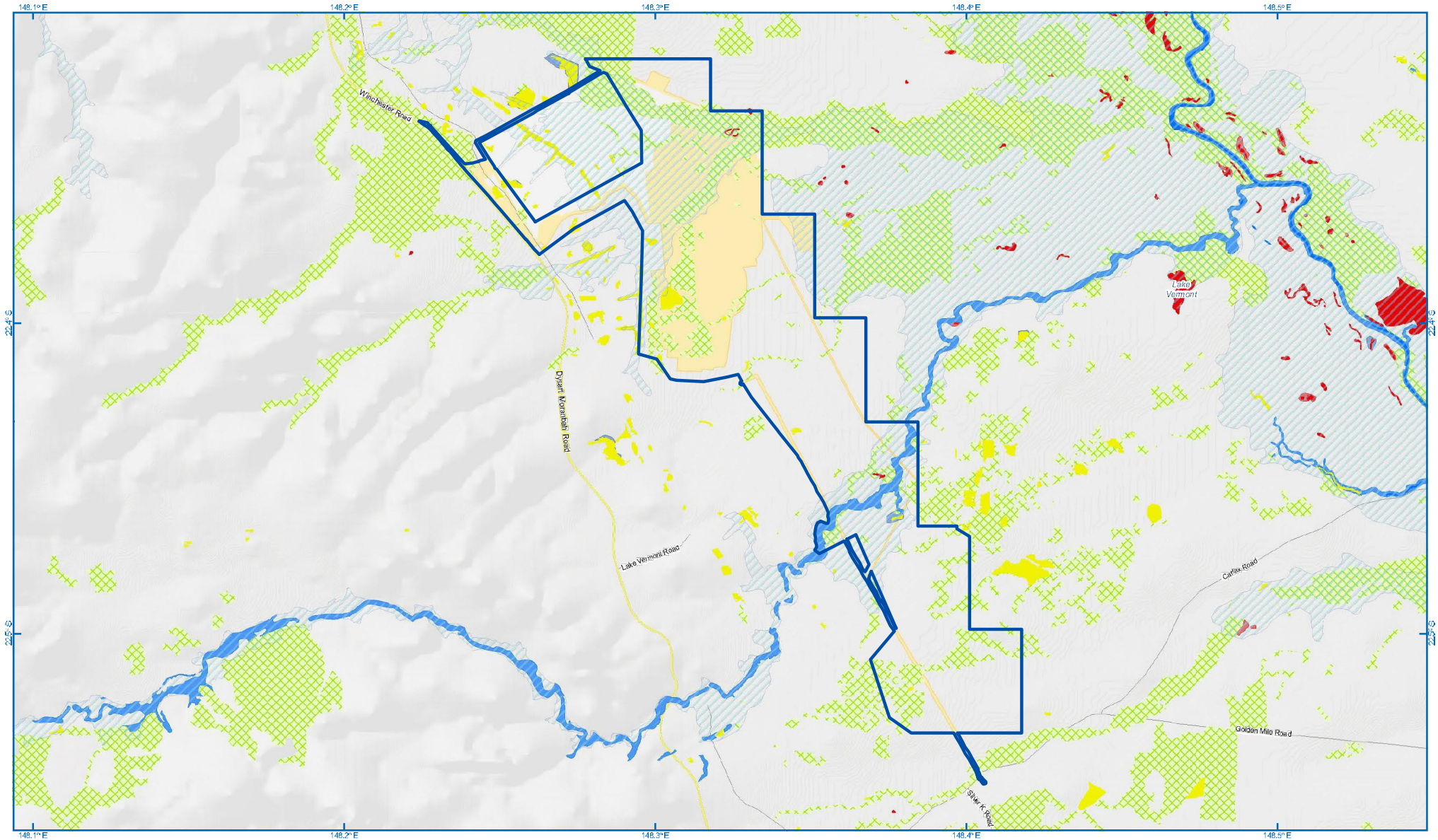
The Project Site is on a floodplain, with watercourses having well-defined channels that follow an irregular sinuous pattern (refer to Map 4.3). There are no high ecological value waters or surface expression groundwater dependent ecosystems in, or surrounding, the Project Site (refer to Map 4.3). There are mapped lacustrine and palustrine wetlands surrounding the Project Site, but relatively few mapped wetlands in the Project Site (refer to Map 4.3). The Isaac River is mapped as a riverine wetland, and Phillips Creek and the Isaac River have mapped riverine regional ecosystems in their riparian zones (refer to Map 4.3).

Land use in and surrounding the Project Site is dominated by low intensity cattle grazing, with much of the native catchment and riparian vegetation having been cleared for pasture grasses. The baseline studies (SKM 2011) noted that cattle access to watercourses was contributing to bank erosion at some sites.

Flow in the Isaac River occurs approximately 27% of the time, typically as discrete short-duration events (Figure 4.1), with flows greater than one cumec (cubic metres per second) (i.e. 86.4 ML/day) occurring only 11% of the time (Figure 4.2). Flows in Plumtree, One Mile, Boomerang and Phillips Creeks are also likely to be infrequent short-duration events, with the magnitude of flows significantly smaller than for the Isaac River. Consequently, these watercourses are highly ephemeral, and aquatic habitat is dominated by small isolated pools within the channel interspersed with large areas of dry stream bed, with larger pools typically found in artificial waterbodies. Larger pools are likely to be perennial or near-perennial and important refugial habitat for aquatic fauna. Smaller shallower pools provide aquatic habitat for briefer periods after rainfall.

Other aquatic habitat features in and surrounding the Project Site include:

- size and depth of pools was variable, with pools in natural watercourses typically isolated, small and shallow;
- artificial waterbodies held more permanent, extensive and deeper bodies of water;
- no sites held flowing water during the baseline surveys;
- substrate had a high proportion of sand in Phillips Creek, but substrate at all other sites was dominated by silt/clay;
- cover of large wood debris (i.e. logs and branches) and fine organic matter (i.e. twigs and leaves) was typically low, but moderate at sites PT1, BB1 and BC1;
- the condition of riparian vegetation was disturbed to highly disturbed at all sites, with spare to low cover of native Eucalyptus trees comprising the canopy at natural watercourse sites; and
- pasture grasses (e.g. buffel grass) dominated the ground stratum.

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# Saraji East Mining Lease Project Environmental Impact Statement: Aquatic Ecology Assessment

## Map 4.3:
## Other Mapped Aquatic Features

**SOURCES**

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**LEGEND**

- Project Footprint
- Project Site
- Floodplain

**Wetlands**

- Riverine Waterbody
- Riverine RE
- Lacustrine Waterbody
- Palustrine Waterbody
- Palustrine RE
- RE 1-50% Wetland
- Lake/Reservoir

**Road Network**

- Main Road
- Local Road

N

**SCALE**

0 0.5 1 2 3 4 5
Kilometres

Scale: 1:125,000 @ A3

**PROJECTION**
Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

**DATE**
2018-09-05

**DRAWN BY**
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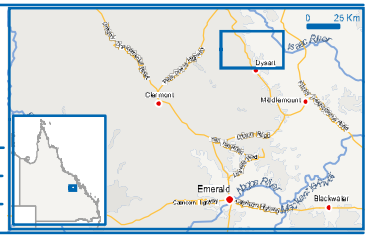
**VERSION**
01



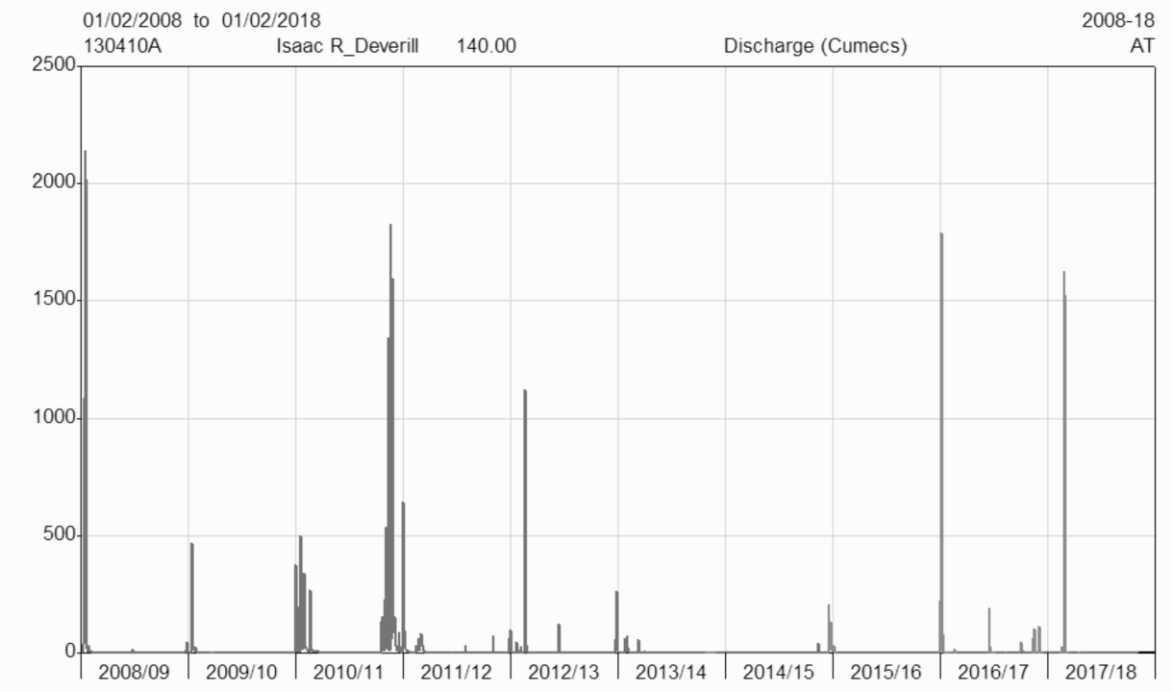



Figure 4.1 Stream flow at DNRME gauging station 130410A

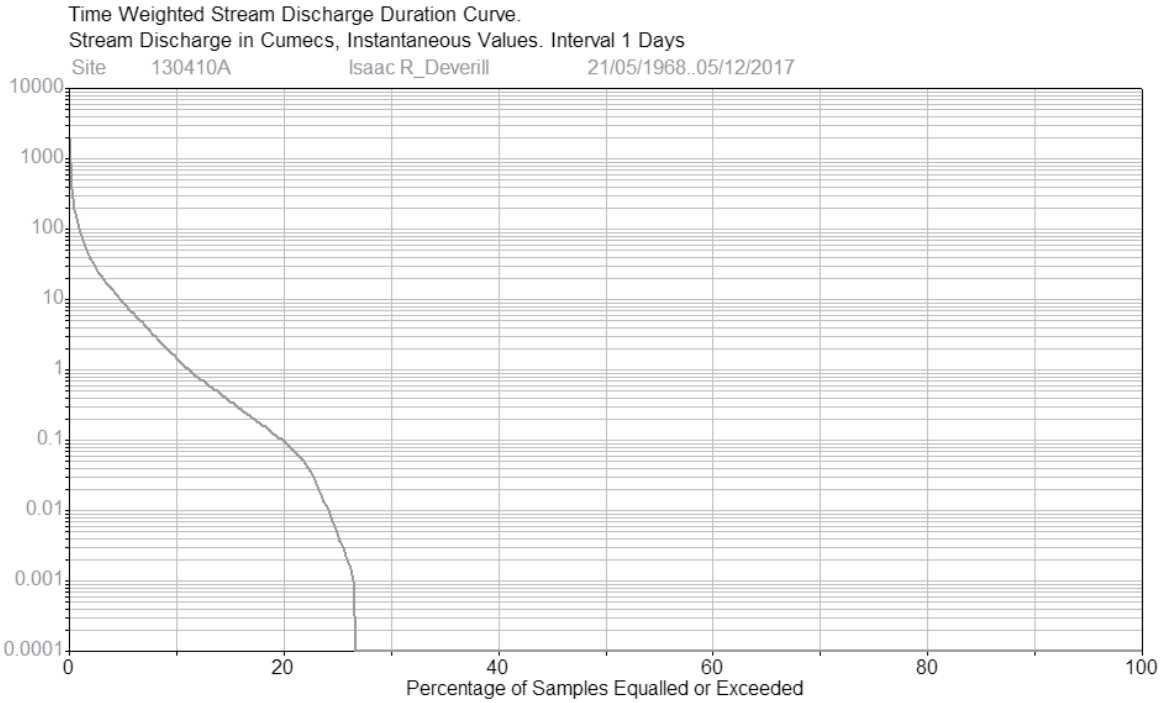



Figure 4.2 Flow duration curve for DNRME gauging station 130410A

## 4.5 Aquatic Biota of the Project Study Area

### Aquatic Plants

The baseline aquatic ecology surveys (SKM 2011) reported generally low cover of aquatic plants. Only site BB1 (Map 3.1) had floating-attached aquatic plants (i.e. *Nymphoides crenata* and *Ottelia ovalifolia*) and the floating pest species, water hyacinth (*Monochoria cyanea*).

Most other sites have low to moderate cover of only emergent aquatic plants in shallow water margins or on dry areas adjacent to water (e.g. *Cyperus* spp, *Eleocharis* sp., Carex sp., and *Pseudoraphis spinescens*). The cover of emergent aquatic plants was high along the western edge of site OMCD.

None of the recorded aquatic plant species are listed as threatened species under the EPBC Act or NC Act.

One pest species of aquatic plant, water hyacinth (*Monochoria cyanea*) was recorded at site BB1. This species is a listed biosecurity matter under the *Biosecurity Act 2014* (Qld).

### Turtles

The baseline aquatic ecology surveys (SKM 2011) reported two sightings of eastern long-necked turtle (*Chelodina longicolis*) from site BB1. Broad-shelled river turtle (*Chelodina expansa*), and possibly Krefft's river turtle (*Emydura macquarii krefftii*), which may also occur in permanent (mainly artificial) waterbodies in, and surrounding, the Project Site. As was outlined in Section 4.1, the nearest likely population of both white-throated snapping turtle and Fitzroy River turtles are likely to be over 70 km downstream from the Project Site in the southern Connors River.

None of the known or possibly occurring species of turtle in or surrounding the Project Site are listed as threatened species under the EPBC Act or NC Act.

### Fish

Eleven native species of fish were caught during the baseline studies (SKM 2011):

- common gudgeons (*Hypseleotris* spp.);
- spangled perch (Leiopotherapon unicolor);

- bony bream (Nematolosa erebi);
- Agassiz's glassfish (*Ambassis agassizii*);
- eastern River rainbowfish (*Melanotaenia splendida*);
- fly-specked hardyhead (Craterocephalus stercusmuscarum);
- Hyrtl's tandan (*Neosilurus hyrtlii*);
- purple spotted gudgeon (*Mogurnda adspersa*);
- sleepy cod (Oxyeleotris lineolata);
- Rendahl's catfish (*Porochilus rendahli*); and
- Empire gudgeons (Hypseleotris compressa).

These are all common species that are tolerant of harsh environmental conditions (e.g. variable flow, fluctuating water quality) that are typical of ephemeral watercourses of the region. All species are potadromous (i.e. they migrate to various extents within freshwaters), except Empire gudgeons which are diadromous (i.e. migrate between freshwater and saltwater). None of these species are listed as threatened species under the EPBC Act or NC Act.

No pest fish species were recorded.

### Macroinvertebrates

Overall, macroinvertebrate communities of edge habitat of watercourses in, and surrounding, the Project Site had low diversity:

- the 2007 survey taxonomic richness ranged from 7 to 17 (all sites were below the applicable WQO); and
- the 2010 survey taxonomic richness ranged from 9 to 27, with most sites having lower macroinvertebrate diversity than the applicable WQO (refer to Table 4.3).

The recorded macroinvertebrates were dominated by insects. For example, the December 2007 survey recorded:

- four families of beetles (Coleoptera);
- three families of flies and midges (Diptera);

- four families of bugs (Hemiptera);
- three families of dragonflies and damselflies (Odonata);
- two families (sensitive taxa) of mayflies (Ephemeroptera); and
- two families (sensitive taxa) of caddisflies (Trichotpera).

Other macroinvertebrate taxa recorded in December 2007 included:

- two families of mussels and clams (Bivalvia);
- two families of snails (Gastropoda);
- one familie of Hydrozoa;
- mites (Acarina);
- three families of macrocrustacea (Decapoda):
- glass shrimp (Atyidae);
- crayfish (Parastacidae); and
- freshwater crabs (Parathelphusidae).

Of these taxa, only four PET (Plecotpera, Ephemeroptera, Trichoptera) taxa were recorded. PET richness ranged from one to three on the following baseline surveys (SKM 2011; Table 4.3):

- Ephemeroptera: Baetidae and Caenidae; and
- Trichoptera: Leptoceridae and Hydroptilidae.

SIGNAL-2 Scores ranged from 2.14 to 3.5 in the December 2007 survey (the applicable WQO range is 3.31 to 4.20), demonstrating that macroinvertebrate communities are dominated tolerant (i.e. not sensitive) taxa and are not sensitive environmental receptors.

SIGNAL bi-plot analysis of the macroinvertebrate data indicated the effects of agricultural pollution, and that aquatic macroinvertebrates in and surrounding the Project Site are tolerant of high turbidity, salinity and/or nutrient levels (SKM 2011).

Redclaw crayfish (*Cherax quadricarinatus*) was recorded at sites PT1, BB1 and LV during the baseline surveys (SKM 2011). While this is a native Australian species, it does not occur naturally in the Fitzroy River basin.

Table 4.3 Macroinvertebrate taxonomic richness and PET richness

| Site | Taxonomic richness | PET richness |
|---|---|---|
| WQO [a] | 23 – 33 | 2 – 5 |
| RHD | 27 | 3 |
| SCD | 19 | 2 |
| LV | 21 | 3 |
| PT1 | 17 | 2 |
| PCUL | 9 | 1 |
| OMC1 | 23 | 3 |
| BB1 | 22 | 2 |
| BC1 | 10 | 1 |
| PCU | 22 | 3 |
| OMCD | 25 | 2 |

[a] WQO = macroinvertebrate Water Quality Objective for macroinvertebrates in edge habitat in moderately disturbed waters of the western upland tributaries of the Isaac River Sub-basin (EHP 2013)

Grey shading denotes when the recorded value for the macroinvertebrate invertebrate index is lower than the WQO

A review of a 2015 macroinvertebrate sample at Saraji Mine also recorded the following PET taxa: Baetidae, Caenidae and Leptoceridae. The review indicated a SIGNAL score of 3.3, further corroborating the above. A review of the CQ University 'Saraji Mine Trend Report 2011-2016' identified that there were no adverse impacts of mine discharge or saline discharge on macroinvertebrate composition and indices detected during the period of 2011 – 2016.

## 4.6 Assessment of Environmental Value

The in-stream aquatic Environmental Value of watercourses in and surrounding the Project Site was assessed as moderate using the criteria presented in Table 3.2.

The watercourses provide favourable habitat for common species of turtle, fish, invertebrates and aquatic plants, noting that in-stream aquatic habitat is often restricted to isolated pools. Aquatic MNES are not reported to occur in or surrounding the Project Site, and while watercourses within the Project Site are mapped as having corridors for fish passage, no species, habitats or ecosystems that are of conservation significance at the State level (i.e. MSES) are present.

All aquatic species recorded from watercourses in and surrounding the Project Site are tolerant of ephemeral flow and variable water quality, and all are common and widespread in the region. No sensitive aquatic environmental receptors are likely to occur in watercourses in, or surrounding, the Project Site.

Riparian vegetation is mapped as regulated vegetation intersecting a watercourse (i.e. a MSES) and thus has high ecological values at the state level. However, it is not considered a sensitive environmental receptor in the context of the Project.

# 5 Aquatic Ecological Impact and Mitigation Assessment

## 5.1 Project Description

The Project comprises a greenfield single-seam underground mine development on MLA 70383 commencing from within ML 1775. The Project proposal also comprises a CHPP, a coal transport conveyor network, a MIA and rail and balloon loops, which are proposed to be located on MLA 70383 and the site of the existing adjacent Saraji Mine.

The Project will mine up to eleven million tonnes per annum (Mtpa) and produce up to 8 Mtpa of product coal for the export market over a 20 year production schedule (FY 2023 – 2042). The overall Project Site is approximately 11,427 hectares (ha), although the Impact Assessment Footprint and Project Footprint are smaller areas within MLA 70383, MLA 70459, ML 70142 and ML 1775 (refer to Map 5.1). A total area of approximately 2,073 ha will be mined underground (using the longwall top coal caving method) within ML 1775 and MLA 70383.

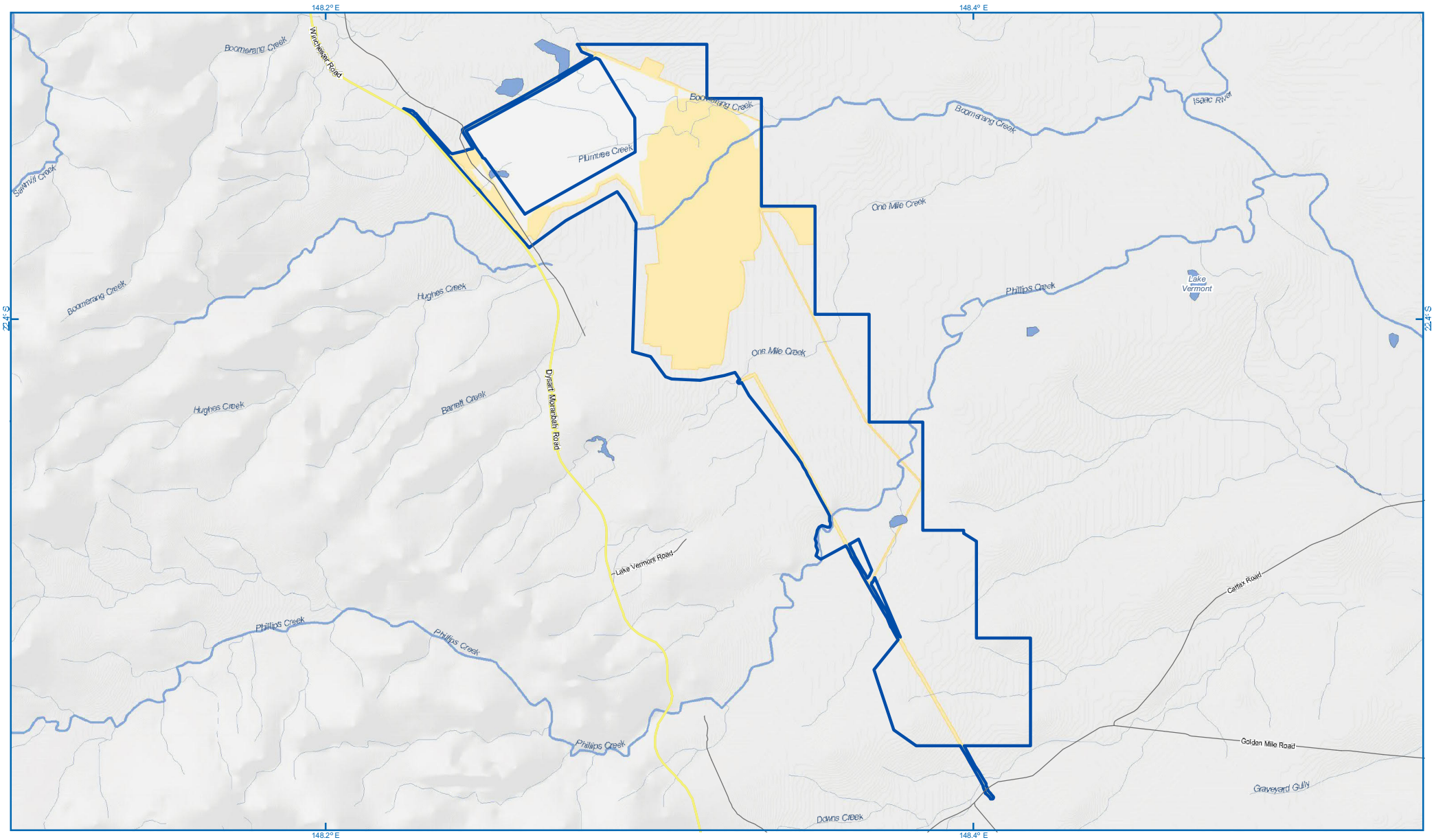
The major phases of the Project are:

- site setup and construction works;
- Project operation; and
- decommissioning and rehabilitation.

A comprehensive Project description is presented in Chapter 3 of the Project EIS.

The following potential sources of impact to aquatic Environmental Values associated with the Project were identified:

- subsidence;
- unplanned discharge of mine-affected water to watercourses;
- watercourse crossings;
- vegetation clearing and earthworks; and
- operation and maintenance of vehicles and other equipment.

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# Saraji East Mining Lease Project Environmental Impact Statement: Aquatic Ecology Assessment

## Map 5.1:
## Project Area and Project Footprint

**SOURCES**

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Document Path: Y:\GIS\Mapping\Mapping\QGIS\7V71011_AECOM_Saraji_EastWorkspace\N71011_Map5.1_Project_Area_18-04-13_AJ.mxd

**LEGEND**

- Project Site
- Project Footprint
- Major Watercourse
- Minor Watercourse
- Lake/Reservoir

**Road Network**

- Main Road
- Local Road

N

**SCALE**

0 0.5 1 2 3 4 5
Kilometres

Scale: 1:120,000 @ A3

**PROJECTION**
Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

**DATE**
2018-09-05

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**VERSION**
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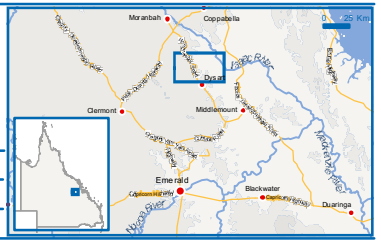

## 5.2 Risk-based Impact Assessment

### Subsidence

#### *Potential Impacts*

Underground mining operations are proposed beneath lower reaches of Plumtree, Boomerang and Hughes Creeks. Subsidence of these watercourses may result in lowered sections of stream bed with abrupt changes in bed level. This may alter natural water flow patterns and restrict the movement of fish, especially during low flow conditions, potentially resulting in fish being stranded in subsided areas.

Many of the fish native to ephemeral systems in central Queensland migrate upstream and downstream and between different habitats at particular stages of their lifecycle, especially at the start of the wet season. Blockages to fish passage may mean that ephemeral wet season aquatic habitat do not become available to fish and turtles, or may mean that fish and turtles cannot move to dry season refugial habitat at the end of the wet season, and thus perish.

Hydrological and biological connectivity between the Isaac River and upper catchment areas of these watercourse may be adversely impacted. Erosion may cause bank failure and in-filling of the channel, which would also create a barrier to fish passage.

#### *Impact Mitigation*

While Boomerang, Hughes and One Mile Creeks are currently diverted upstream of the Project Site to manage impacts from existing mining Projects (Boomerang Creek diversion by Peak Downs Mine, and Hughes Creek and One Mile Creek diversions by Saraji Mine), further diversion of these watercourses is not proposed within the scope of the Project. Impacts from subsidence will instead be managed through development and implementation of a Subsidence Management Plan that considers:

- erosion protection measures, including revegetation as appropriate;
- development and implementation of an appropriate watercourse monitoring program.

### *Risk Assessment*

The *consequence* of impacts from subsidence of watercourses is moderate, because hydrological and biological connectivity could be adversely impacted, and fish could be stranded. Impact would be greatest under low flow conditions and less severe under high flow conditions.

The likelihood of impacts from subsidence is low because the monitoring program will identify the need for erosion protection, bed re-profiling or other rehabilitation. These management measures will be implemented where practical. Furthermore, only common species of fish and turtle are known to exist in these watercourses. These species have good dispersal capabilities and are tolerant of harsh environmental conditions, and they are not sensitive environmental receptors for minor modifications to the watercourses (i.e. those that remain after rehabilitation measures have been implemented).

The mitigated risk of impact to aquatic ecological values from subsidence is low.

## Unplanned Discharges of Mine-affected Water to Watercourses

### *Potential Impacts*

Unplanned discharges of mine-affected water to watercourses would occur from overspilling, seepage or failure of the water management dams. Run-off from overburden stockpiles and leachate may also contribute to uncontrolled discharges of mine affected water.

Unplanned discharges of mine affected water (i.e. water with potentially high electrical conductivity, high or low pH, and potentially high concentrations of metals and sulfates) that may impact water quality and aquatic ecology in the receiving environment. Unplanned discharges of mine-affected water may not have the same water quality and flow conditions that control any impact to the receiving environment associated with planned discharges. Therefore, unplanned discharges may have a greater impact on the receiving environment than planned discharges, noting that the Project does not include any planned discharges of mine-affected water.

### *Impact Mitigation*

All dams for the Project will be constructed in accordance with the Department of Environment and Heritage Protection's (DEHP's) Manual for Assessing Consequence

Categories and Hydraulic Performance of Structures (EHP 2016) (or the manual current at the time of design) and will be above the Q100 flood line (i.e. water level from a 'one in 100 year' flood event). Seepage from, and failure of, these dams is also unlikely because they will be compliant with regulator approved engineering and design specifications.

Water quality will be monitored in accordance with a site Water Management Plan (WMP) to ensure that key water quality parameters remain within acceptable criteria.

### *Risk Assessment*

The *consequence* of unplanned discharges on water quality and aquatic ecology is *moderate*; although the likelihood of unplanned discharge is low.

The mitigated risk of unplanned discharges on water quality and aquatic ecology is low.

## Watercourse Crossings

### *Potential Impacts*

Construction of watercourse crossings for access roads, haul roads, rail lines and pipelines (or other linear infrastructure) may disturb bank and bed sediments, leading to increases in localised turbidity and sediment deposition. This is especially pertinent where construction occurs during the wet season. After installation of crossings, stream beds and banks may continue to erode during high flows in the absence of appropriate bed and bank stabilisation and rehabilitation. This may result in an increase in channel width and a loss in channel definition, which results in loss of aquatic habitat for stream fauna.

Poorly constructed watercourse crossings may also create waterway barriers that prevent or impede movements of aquatic fauna such as fish and turtles during flow events. Many of the fish native to ephemeral systems in central Queensland migrate upstream and downstream and between different habitats at particular stages of their lifecycle, especially at the start of the wet season.

Blockages to fish passage may mean that ephemeral wet season aquatic habitats do not become available to fish and turtles, or may mean that fish and turtles cannot move to dry season refugial habitat at the end of the wet season, and thus perish.

### *Impact Mitigation*

Watercourses within the Project Site are mapped as moderate, high or major risk of impact to fish passage. The design and construction of road and rail crossings, as well as any other watercourse crossing by linear infrastructure (e.g. pipes for water supply), will aim to, where practical, ensure that fish passage is maintained throughout these watercourses. It should be noted that BMA will be exempt from obtaining any on-lease waterway barrier works approvals for operational works within fish passage.

Where practical, road, rail and pipeline crossings of watercourses will be constructed in the dry season, when watercourses are dry and rainfall is unlikely. Crossing locations will preferentially be selected in areas where the bank gradient is low, and in areas where riparian vegetation in good condition will be avoided as far as practical. Ongoing impacts associated with erosion or failing banks can be mitigated by progressive rehabilitation.

Where creek crossings are in areas with either pooled or flowing water, isolation of the workspace will minimise impacts to water quality. The isolation should be designed such that, where practicable:

- it is completed within one work-day;
- upstream and downstream dams are installed on the edge of the temporary workspace, and will be constructed of an appropriate material for each creek (e.g. steel plates, flumes, sand bags or aquadam) and be made impermeable by using polyethylene liner and sand bags;
- downstream flow is maintained around the workspace by using appropriately sized pumps and flumes;
- sediment-laden water is pumped into sumps or onto grassed areas that which will trap sediments; and
- upon completion of construction, the downstream dam is removed first, then the upstream dam is slowly removed, allowing water to flush the sediment from the workspace area.

### *Risk Assessment*

The consequence of watercourse crossings on aquatic ecology is moderate, because watercourses in the Project Site are mapped as having moderate, high or major risk of impact to fish passage. The likelihood of impact is low where appropriate impact mitigation measures are adopted (e.g. undertaking construction during the dry season,

undertaking appropriate bed and bank rehabilitation works, and sizing culverts so that fish passage is maintained during low flow events.

The mitigated risk of watercourse crossings on aquatic ecology is low.

## Vegetation Clearing and Earthworks

### *Potential Impacts*

There is a high potential for soil erosion and sedimentation of watercourses following vegetation clearing and earthworks, especially during the wet season when rainfall and run-off intensity is greatest. Stockpiles of soil may also cause increased turbidity and sedimentation of watercourses where rainfall and run-off washes soil to watercourses.

Increased turbidity may negatively impact fish and macroinvertebrates, because highly turbid water reduces respiratory and feeding efficiency (Schlosser 1978: cited in Russell & Hales 1993). Increased turbidity may also adversely affect submerged aquatic plants as light penetration (required for photosynthesis) is reduced. Reduced light penetration can also lead to a reduction in temperature throughout the water column (DNR 1998).

Small increases in turbidity would be unlikely to have a significant impact on aquatic ecology, as aquatic species of the region are tolerant of moderate turbidity. However, significant increases in turbidity could adversely impact the health, feeding and breeding ecology of some species of macroinvertebrates and fish, and aquatic plant growth within and downstream of the Project Site.

Sedimentation of watercourses can impact aquatic ecology by smothering stream beds with fine material, and decreasing bed roughness and reducing habitat diversity (e.g. smothering divers substrate types such as sand, and gravels and cobbles, smothering woody debris, making pools shallower, and in-filling under-cut banks that provide important habitat for fish). Decreases in available habitat for aquatic fauna due to sedimentation could reduce breeding opportunities and increase predation (e.g. by birds), potentially causing a localised decline in abundance and diversity of aquatic species.

### *Impact Mitigation*

The impact of increased turbidity on aquatic ecology associated with vegetation clearing, earth works and stockpiles of soil will be minimal because the extent of clearing needed is low (the MIA will be constructed on land that is already cleared and mining will be underground). However, further impact mitigation will be achieved by implementation of

an Erosion and Sediment Control Plan (ESCP) during the construction, operation and rehabilitation phases of the Project, and implementation of a rehabilitation management plan.

The ESCPs will include, but not be limited to:

- sediment dams constructed prior to vegetation clearing and earthworks;
- incremental stages of vegetation clearing and earthworks over the life of the mine;
- timing of clearing and earthworks for construction of creek crossings or diversions is in the dry season if possible;
- contour banks, ditches or similar will be formed across cleared slopes to direct runoff towards surrounding vegetation or sediment dams, and away from creeks; and
- monitoring of turbidity during construction stages, with review of erosion and sediment controls where an increase in turbidity is detected.

### *Risk Assessment*

The consequence of increased turbidity and sedimentation is moderate and the likelihood of increased turbidity and sedimentation is low where the ESC and rehabilitation plans are implemented.

The mitigated risk of increased turbidity and sedimentation to aquatic ecology is low.

## Operation and Maintenance of Vehicles and Other Equipment

### *Potential Impacts*

Fuels, oils and other chemicals (e.g. lubricants and solvents) required for the operation of vehicles and mining machinery are toxic to aquatic flora and fauna at relatively low concentrations. Spilt fuel is most likely to enter watercourses via an accidental spill on the roads near watercourse crossings, or when there are construction activities adjacent to watercourses.

A significant fuel spill in a waterways (in the order of tens or hundreds of litres) is likely to have a locally significant impact on both flora and fauna, with the size of spill and the volume of water in the creeks being the most significant factors influencing the length of

stream impacted. Other wastes associated with vehicle and machine maintenance also have the potential to contribute to the degradation of aquatic ecosystems.

Vehicles and machinery can also be vectors of dispersal for aquatic biosecurity matters such as listed aquatic weeds. Aquatic weeds can reduce the habitat quality of watercourses for native fish, and dense growth of aquatic weeds can cause a barrier to fish passage. The spread of aquatic weeds (e.g. through vehicle movements) listed under the *Biosecurity Act 2014* is a contravention of this legislation.

### *Impact Mitigation*

Spill kits will be available at all times. The storage and use of fuels, oils and batteries within the MIA will be in accordance with Australian Standard 1940 (2004) – *The storage and handling of flammable and combustible liquids.*

Use of equipment that is susceptible to spills and/or leakages of fuels will have appropriate spills kits located local to the equipment, with kits that can contain and clean spills on land, in dry watercourses and wet watercourses being available at all times.

It is unlikely that a direct spill will occur within a watercourse; however, should a spill occur then this will be reported in line with the BMA operating procedures and relevant stakeholders will be contacted as necessary.

All vehicles and machinery entering and leaving the Project Site will be subject to strict weed hygiene protocols to control the spread of weeds, including aquatic weeds.

### *Risk Assessment*

The consequence of impact to aquatic ecosystems from spilt fuels and oils is moderate and the consequence of impacts from aquatic weeds is moderate because the watercourses of the Project Site are not considered sensitive environmental receptors.

The likelihood of spills entering water sources or wetland areas is low where refuelling and maintenance of vehicles is restricted to the MIA, and the MIA is designed to comply with appropriate Australian Standards. The likelihood of aquatic weeds entering watercourses from vehicles is low where strict weed hygiene protocols are in place and adhered to.

The mitigated risk of fuel and oil spills, and spread of aquatic weeds on vehicles, to aquatic ecology is low.

## 5.3 Assessment Using the MNES Significant Impact Criteria

### The Sensitivity of the Environment that will be Impacted

Watercourses of the Project Site are not considered potentially sensitive environmental receptors because:

- the natural aquatic ecological conditions of these watercourses, including flows and water quality, are highly variable and often harsh;
- there are no threatened aquatic species that inhabit these watercourses, and the common aquatic biota that inhabit them are tolerant of harsh environmental conditions and relatively poor water quality; and
- taxa that are potentially sensitive to harsh environmental conditions are either rare or very rare in these watercourses.

### The Timing, Duration and Frequency of the Action and its Impacts

The Project is assumed to commence construction in Financial Year (FY) 2021 with operations commencing in FY 2023 and have an approximate life of 20 years. Site rehabilitation, including any necessary rehabilitation of watercourses, will ensure there are no potential to generate future pollution or adversely affect watercourses in and surrounding the Project Site, as required by the *Guideline for Rehabilitation Requirements for Mining Resource Activities* (EHP 2014). The Project's rehabilitation management plan has considered the requirements of the *Mined Land Rehabilitation Policy* (DES, 2018).

### On-site and Off-site, and Direct and Indirect Impacts

Potential direct and indirect impacts of the Project are mainly on-site (e.g. subsidence) with some potential impacts also affecting off-site areas (e.g. barriers to fish passage and downstream sedimentation). However, the risk of adverse impact from these sources of potential impact has been assessed as low (refer to Section 5.1).

### The Total Impact that can be Attributed to the Action

Watercourses within the vicinity of the Project Site were identified as not having sensitive environmental receptors, and that the risk of adverse ecological impact from all sources of

potential impact was low (refer to Section 5.1). There are not anticipated to be ongoing impacts to the aquatic Environmental Values of watercourses of the Project Site.

### Existing Levels of Impact from Other Sources

Catchment and riparian vegetation clearing, and cattle access to watercourses, which cause bank and bed erosion, are existing widespread disturbances that impact the aquatic ecological values of watercourses of the Project Site. The potential sources of impact will not interact with any existing source of impact, where the mitigations described in Section 5.1 are implemented.

### The Degree of Confidence with which the Impacts of the Action are Known and Understood

It is considered that potential impacts of the Project on the aquatic ecology of watercourses of the Project Site have been assessed with a moderate to high degree of confidence, because:

- the Environmental Values assessment was based on baseline survey data supported by database and literature searches; and
- the potential impact of underground coal mining operations on aquatic Environmental Values is well understood by specialist aquatic ecologists.

### Mitigation Measures

The measures described in Section 5.1 will effectively mitigate anticipated impacts, with watercourse monitoring enabling ongoing evaluation of environmental changes and management responses where necessary.

### Assessment Against the Significant Impact Criteria

An assessment against the Significant Impact Criteria for threatened aquatic species is presented in Table 5.1.

The assessment indicates a significant impact on aquatic MNES species as a result of the Project is highly unlikely.

Table 5.1 Assessment of the Project on Aquatic MNES Species in and downstream of the Project Site

| Significant Impact Criteria | Will the action have a significant impact? | Justification |
|---|---|---|
| **Criteria specific to critically endangered species: white-throated snapping turtle** | | |
| Lead to a long-term decrease in the size of a population of a species | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest likely population is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not lead to a long-term decrease in the size of any population of white-throated snapping turtle. |
| **Criteria specific to vulnerable species: Fitzroy River turtle** | | |
| Lead to a long-term decrease in the size of an important population of a species | No | The nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site, and the nearest likely population is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not lead to a long-term decrease in the size of any population of Fitzroy River turtle. |

| Significant Impact Criteria | Will the action have a significant impact? | Justification |
|---|---|---|
| **Criteria that apply to both endangered and vulnerable species: white-throated snapping turtle and Fitzroy River turtle** | | |
| Reduce the area of occupancy of the species | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not reduce the area of occupancy of either species. |

| Significant Impact Criteria | Will the action have a significant impact? | Justification |
|---|---|---|
| Fragment an existing population into two or more populations | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not fragment an existing population of either species into two or more populations. |
| Adversely affect habitat critical to the survival of a species | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not affect any habitat important for either species. |

| Significant Impact Criteria | Will the action have a significant impact? | Justification |
|---|---|---|
| Disrupt the breeding cycle of a population | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project study area. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not disrupt the breeding cycle of any population of either species. |
| Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project will not modify, destroy, remove, isolate or decrease habitat availability or quality for either species. |

| Significant Impact Criteria | Will the action have a significant impact? | Justification |
|---|---|---|
| Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology, including spread of aquatic weeds. The Project will not results in the establishment of an invasive species that would be harmful to either species. |
| Introduce disease that may cause the species to decline | No | The Project is very unlikely to introduce a disease that will cause any aquatic MNES species to decline. |

| Significant Impact Criteria | Will the action have a significant impact? | Justification |
|---|---|---|
| Interfere with the recovery of the species | No | The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both species is approximately 70 km (straight-line distance) downstream of the Project Site. These populations are sufficiently remote as to have no risk of impact from the Project. Furthermore, risk-based impact assessment (refer to Section 5.1) determined that all potential sources of impact had low risk of impact to aquatic ecology. The Project is very unlikely to interfere with the recovery of either species. |

# 6 Conclusions

The following potential sources of impact to aquatic Environmental Values associated with the Project were identified:

- subsidence;
- unplanned discharge of mine-affected water to watercourses;
- watercourse crossings;
- vegetation clearing and earthworks; and
- operation and maintenance of vehicles and other equipment.

The consequence of impact from each source of impact was assessed as moderate, however the likelihood of impact was low where the identified mitigations were applied. Therefore, there was low risk of adverse impact to the aquatic Environmental Values of watercourses in and surrounding the Project Site.

The two identified aquatic MNES (white-throated snapping turtle and Fitzroy River turtle) are sufficiently remote as to have no risk of impact from the Project. The nearest known population of white-throated snapping turtle is approximately 80 km (straight-line distance) downstream from the Project Site, and the nearest known population of Fitzroy River turtle is approximately 90 km (straight-line distance) downstream from the Project Site. The nearest likely population of both of these MNES species is approximately 70 km (straight-line distance) downstream of the Project Site. Therefore the Project will have no impact on any aquatic MNES.

# 7 References

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Threatened Species Scientific Committee, 2008, Approved Conservation Advice for *Rheodytes leukops* (Fitzroy Tortoise), http://www.environment.gov.au/biodiversity/threatened/species/pubs/1761-conservation-advice.pdf, accessed March 2018.

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# Appendix A Baseline Aquatic Ecology Survey Methods

Baseline aquatic ecology surveys were completed in December 2007 and April 2010 (SKM 2011) at the sites presented in Table A-1. The following aquatic ecological components were surveyed:

- water quality, which was assessed using a calibrated hand held water quality meter;
- aquatic habitat, which included taking site notes of:
  - substrate composition;
  - bank characteristics (slope, height, vegetative cover, erosion);
  - hydrological characteristics (wetted width, water depth, flow velocity, flow habitats, connectivity/isolation of pools);
  - riparian vegetation cover and condition; and
  - physical habitat features (undercut banks, large woody debris.
- macroinvertebrates, which were surveyed from using three replicate samples from edge habitat using standard triangular dip nets in accordance with the AUSRIVAS protocol (DNRM 2001);
- fish, for which all available habitats were surveyed using (see Table A-1):
  - electrofishing, which comprised eight replicate 150 second fishing ‘shots’ using a backpack electrofishing unit;
  - bait traps, with 10 traps set in shallow water;
  - fyke nets, with one or more net set overnight in deep (i.e. >0.4 m) water;
  - seine net, with multiple hauls made through suitable habitat; and
  - dip net, which was used to sample small fish in shallow habitats.
- turtles, using fyke nets.

Table A.1 Survey sites for the aquatic ecology baseline studies

| Site | Description | Latitude | Longitude | Fishing method [a] |
|---|---|---|---|---|
| PCU | Phillips Creek Upstream | -22.520 | 148.305 | BT, DN |
| PCUL | Phillips Creek Upstream Of Lease | -22.461 | 148.356 | DN |
| PT1 | Plumtree Creek 1 | -22.342 | 148.299 | BT, EF |
| RHD | Railway Head Dam | -22.479 | 148.398 | SN |
| SCD | Southern Creek Dam | -22.517 | 148.382 | SN |
| BB1 | Boomerang Billabong 1 | -22.338 | 148.325 | BT, EF, FN |
| BC1 | Boomerang Creek 1 | -22.334 | 148.322 | BT, EF |
| LV | Lake Vermont | -22.461 | 148.380 | BT, EF, SN |
| OMC1 | One Mile Creek | -22.413 | 148.331 | BT, SN |
| OMCD | One Mile Creek Dam | -22.412 | 148.330 | BT, EF |

[a] BT = bait trap; DN = dip net; EF = electrofishing; FN = fyke net; SN = seine net

## References

DNRM 2001. *Queensland Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual, August 2001*. Queensland Department of Natural Resources and Mines, Brisbane.

# Appendix B MNES Search Results

Australian Government
Department of the Environment

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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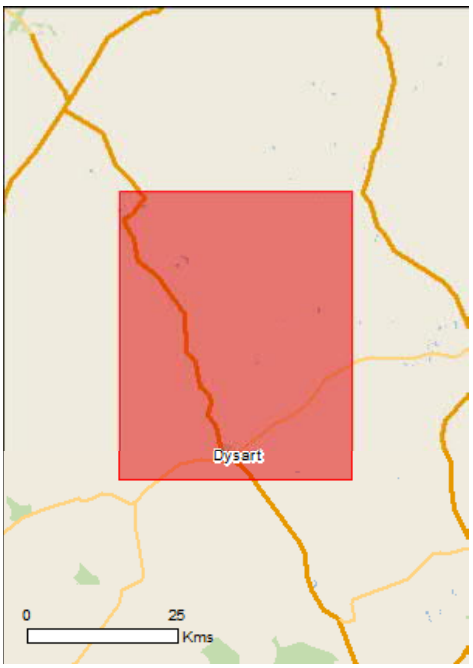


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Coordinates
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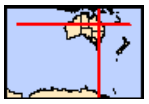

# Summary

## Matters of National Environmental Significance

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

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 4 |
| Listed Threatened Species: | 22 |
| Listed Migratory Species: | 9 |

## Other Matters Protected by the EPBC Act

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

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

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

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 15 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Commonwealth Reserves Marine: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | 1 |
| Regional Forest Agreements: | None |
| Invasive Species: | 20 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities [ Resource Information ]

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

| Name | Status | Type of Presence |
|---|---|---|
| Brigalow (Acacia harpophylla dominant and co-dominant) | Endangered | Community known to occur within area |
| Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin | Endangered | Community likely to occur within area |
| Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions | Endangered | Community likely to occur within area |
| Weeping Myall Woodlands | Endangered | Community likely to occur within area |

### Listed Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| **Birds** | | |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Erythrotriorchis radiatus<br>Red Goshawk [942] | Vulnerable | Species or species habitat likely to occur within area |
| Geophaps scripta scripta<br>Squatter Pigeon (southern) [64440] | Vulnerable | Species or species habitat known to occur within area |
| Grantiella picta<br>Painted Honeyeater [470] | Vulnerable | Species or species habitat may occur within area |
| Neochmia ruficauda ruficauda<br>Star Finch (eastern), Star Finch (southern) [26027] | Endangered | Species or species habitat likely to occur within area |
| Poephila cincta cincta<br>Southern Black-throated Finch [64447] | Endangered | Species or species habitat may occur within area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat may occur within area |
| **Mammals** | | |
| Dasyurus hallucatus<br>Northern Quoll, Digul [331] | Endangered | Species or species habitat likely to occur within area |
| Macroderma gigas<br>Ghost Bat [174] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Nyctophilus corbeni<br>Corben's Long-eared Bat, South-eastern Long-eared Bat [83395] | Vulnerable | Species or species habitat may occur within area |
| Petauroides volans<br>Greater Glider [254] | Vulnerable | Species or species habitat known to occur within area |
| Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)<br>Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] | Vulnerable | Species or species habitat known to occur within area |
| Pteropus poliocephalus<br>Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Other | | |
| Cycas ophiolitica<br>[55797] | Endangered | Species or species habitat likely to occur within area |
| Plants | | |
| Aristida annua<br>[17906] | Vulnerable | Species or species habitat likely to occur within area |
| Dichanthium queenslandicum<br>King Blue-grass [5481] | Endangered | Species or species habitat likely to occur within area |
| Reptiles | | |
| Denisonia maculata<br>Ornamental Snake [1193] | Vulnerable | Species or species habitat known to occur within area |
| Egernia rugosa<br>Yakka Skink [1420] | Vulnerable | Species or species habitat may occur within area |
| Elseya albagula<br>Southern Snapping Turtle, White-throated Snapping Turtle [81648] | Critically Endangered | Species or species habitat likely to occur within area |
| Furina dunmalli<br>Dunmall's Snake [59254] | Vulnerable | Species or species habitat may occur within area |
| Lerista allanae<br>Allan's Lerista, Retro Slider [1378] | Endangered | Species or species habitat may occur within area |
| Rheodytes leukops<br>Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761] | Vulnerable | Species or species habitat likely to occur within area |

## Listed Migratory Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| Migratory Marine Birds | | |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Migratory Terrestrial Species | | |
| Cuculus optatus<br>Oriental Cuckoo, Horsfield's Cuckoo [86651] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat known to occur |

| Name | Threatened | Type of Presence within area |
|---|---|---|
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat likely to occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

**Listed Marine Species** [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| **Birds** | | |
| Anseranas semipalmata<br>Magpie Goose [978] | | Species or species habitat may occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea alba<br>Great Egret, White Egret [59541] | | Species or species habitat known to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Cuculus saturatus<br>Oriental Cuckoo, Himalayan Cuckoo [710] | | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat known to occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat likely to occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat may occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat may occur within area |

## Extra Information

### State and Territory Reserves [ Resource Information ]

| Name | State |
|---|---|
| Coolibah | QLD |

### Invasive Species [ Resource Information ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Columba livia<br>Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Lonchura punctulata<br>Nutmeg Mannikin [399] | | Species or species habitat likely to occur within area |
| Passer domesticus<br>House Sparrow [405] | | Species or species habitat likely to occur within area |
| Frogs | | |
| Rhinella marina<br>Cane Toad [83218] | | Species or species habitat likely to occur within area |
| Mammals | | |
| Bos taurus<br>Domestic Cattle [16] | | Species or species habitat likely to occur |

| Name | Status | Type of Presence within area |
|---|---|---|
| Canis lupus familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Feral deer<br>Feral deer species in Australia [85733] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Sus scrofa<br>Pig [6] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| **Plants** | | |
| Acacia nilotica subsp. indica<br>Prickly Acacia [6196] | | Species or species habitat may occur within area |
| Cryptostegia grandiflora<br>Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913] | | Species or species habitat likely to occur within area |
| Jatropha gossypifolia<br>Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507] | | Species or species habitat likely to occur within area |
| Lantana camara<br>Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] | | Species or species habitat likely to occur within area |
| Opuntia spp.<br>Prickly Pears [82753] | | Species or species habitat likely to occur within area |
| Parkinsonia aculeata<br>Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301] | | Species or species habitat likely to occur within area |
| Parthenium hysterophorus<br>Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566] | | Species or species habitat likely to occur within area |
| Vachellia nilotica<br>Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351] | | Species or species habitat likely to occur within area |

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

# Coordinates

-22.2247 148.17096,-22.2247 148.518,-22.6227 148.518,-22.6227 148.17096,-22.2247 148.17096

# Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
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-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

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# Appendix C White-throated snapping turtle (*Elseya albagula*)

## *Description*

The white-throated snapping turtle (*Elseya albagula*) is one of the largest short-necked freshwater turtles in Australia. Adults of this species are large and heavily built. Females are larger than males, however males have a longer tail length than females (Hamann et al. 2007; Limpus et al. 2007). Straight carapace length for adult males ranges from 15.6 cm to 29.2 cm, while the average carapace length for adult females ranges from 26.1 cm to 40.1 cm (Limpus et al. 2007).

The size of white-throated snapping turtles also varies between geographic locations; however, the cause of this variation is unknown (Hamann et al. 2007; Limpus et al. 2007). Female white-throated snapping turtles are distinguished from similar species by irregular white or cream markings on the face, and the shell margin is strongly serrated on juveniles (Threatened Species Scientific Committee 2014).

## *Status Under Commonwealth and State Legislation*

The white-throated snapping turtle is listed as critically endangered under the EPBC Act and endangered under the NC Act.

## *Distribution*

The white-throated snapping turtle is restricted to the Fitzroy, Mary and Burnett river catchments in Queensland (Threatened Species Scientific Committee 2014). The species has also been recorded in:

- small coastal river adjacent basins, including the Kolan and Gregory-Burrum systems (Hamann et al. 2007);
- impoundments upstream of weirs such as Eden Bann Weir and Glebe Weir (Limpus et al. 2007); and
- the spring-fed pools of the Dawson River (Hamann et al. 2007).

There has been a severe decrease in the abundance of immature white-throated snapping turtles in wild populations throughout the Fitzroy, Mary and Burnett river catchments (Hamann et al. 2007; Limpus 2008; Limpus et al. 2011). The wild population is composed primarily of aging adults in each catchment, and there has been a substantial failure to recruit new adults into the breeding populations due to nest predation by a range of exotic and native predators, with only:

- 0.5% of adults being new recruits to the breeding population in the Fitzroy River catchment (211 adult females examined);
- 0.9% of adults being new recruits to the breeding population in the Burnett River catchment (an additional 0.9% of the adults were identified to their 2nd breeding season of the 331 adult females that were examined); and
- 1.1% of adults being new recruits to the breeding population in the Mary River catchment (of the 175 adult females that were examined) (Threatened Species Scientific Committee 2014).

Genetic studies indicate some distinction between the population of white-throated snapping turtles in the Fitzroy River catchment and populations in the Mary and Burnett river catchments. This indicates these populations have been separated for a long time and could be considered Evolutionary Significant Units (Todd et al. 2013; Threatened Species Scientific Committee 2014).

### *Habitat*

White-throated snapping turtles are habitat specialists that prefer permanent, clear, well oxygenated water that is flowing and contains shelter (e.g. large woody debris and undercut banks) (Todd et al. 2013). The species has also been recorded in non-flowing waters, such as impoundments, but only in low numbers (Threatened Species Scientific Committee 2014). Within the greater Fitzroy, Burnett and Mary river catchments, this species has been recorded almost exclusively in close association with permanent flowing stream reaches that are typically characterised by a sand-gravel substrate with submerged rock crevices, undercut banks and/or submerged logs and fallen trees (Hamann et al. 2007). Capture records suggest that white-throated snapping turtles are rarely found in reaches without such refuge (Hamann et al. 2007; Limpus et al. 2007). Across its distribution, individuals have been recorded from both shallow flowing pools and deeper slow flowing pools (Hamann et al. 2007).

White-throated snapping turtles are rarely present in water bodies that are isolated from flowing streams, such as farm dams or sewage treatment plants, suggesting that the species does not move extended distances over dry land (Hamann et al. 2007). However, white-throated snapping turtles have been observed walking short distances from drying waterholes to nearby water bodies (Limpus et al. 2007).

### *Ecology*

The life history of white-throated snapping turtles is characterised by a long life span and slow growth to maturity (Threatened Species Scientific Committee 2014). The age at first breeding is approximately 15 to 20 years (Limpus et al. 2011). Breeding occurs once per year, mostly during autumn and winter, with adult females breeding in each successive year unless the turtle has been injured or debilitated, or riverine habitat has been altered (e.g. water extraction, drought or weeds) (Threatened Species Scientific Committee 2014). Females generally nest on sandy banks, although nests have been observed on loose gravels and soils. Females lay a single clutch of eggs during the breeding season, with an average of 14 eggs per clutch (Hamann et al. 2007; Limpus et al. 2011). Nests are generally laid in areas of low canopy cover and in areas of dense grass cover; however, dense weeds at the water's edge may limit suitability of potential nesting banks (Hamann et al. 2007; Limpus et al. 2011). Nests are an average of 16.6 m from the water's edge, with eggs laid in deep chambers (greater than 20 cm in depth) and on banks with a slope of up to 26.5º (Hamann et al. 2007; Limpus et al. 2011). However, nests have been recorded up to 60 m from the water (Hamann et al. 2007). White-throated snapping turtles will repeatedly use specific areas of banks over multiple years (Limpus et al. 2007).

There is no parental care, and egg and small juvenile survival is typically low (Heppell et al. 1996; Hamann et al. 2007). There is abundant evidence of nesting in all three river basins (i.e. Fitzroy, Burnett and Mary River Basins), but most eggs are lost to predation or trampling by stock (Hamann et al. 2007; Limpus et al. 2011). The population growth or decline rate is highly responsive to changes in adult survivorship, rather than changes in egg or juvenile survivorship (Heppell et al. 1996). Nonetheless, where egg predation rates are high, population growth rate will be constrained.

White-throated snapping turtles feed primarily on aquatic plants along with fruits and leaves from overhanging riparian vegetation (Limpus et al. 2007). They may also eat periphyton, freshwater bivalves and insects, particularly when plant food resources are limited (Limpus et al. 2007).

Little is known of the movement patterns of these turtles in the greater Fitzroy River catchment. However, in the Burnett River they generally have small home ranges of less than 500 m and have limited spatial and temporal movements (Hamann et al. 2007).

### *Threats*

The principal threat to white-throated snapping turtles in all three catchments is the excessive loss of eggs and hatchlings due to predation (Threatened Species Scientific Committee 2014). Primary predators include feral (e.g. foxes, dogs, pigs and cats) and native (e.g. water rats and lizards) animals. Trampling of nests by cattle is also a major threat.

An additional threat to this species includes limited suitable habitat, which is highly fragmented across its distribution range due to dams and weirs. Waterway impoundments, such as dams, barrages and weirs, also form significant barriers to the passage of freshwater turtles. The number of dead and injured turtles can be much greater in pools immediately downstream of weirs than in pools distant from weirs, presumably a result of turtles being swept downstream and over impoundments during major and sudden water releases (Hamann et al. 2007).

Other threats to this species are:

- stocking of fish into dam impoundments for recreational fishing;
- recreational fishing resulting in hook injuries;
- boat strike;
- loss of nesting habitat to weed infestation in the riparian zone;
- dense aquatic weeds in the waterways; and
- water extraction for agriculture and irrigation (Limpus et al. 2011).

### *Recovery Actions*

There is currently no federal recovery plan for the white-throated snapping turtle; however, the development of a plan is recommended. The conservation advice outlines that primary conservation objectives should be to increase hatchling success to levels that allow the development of a healthy population structure (Threatened Species Scientific Committee 2014).

Conservation advice to do this recommend plans should aim to:

- increase the protection of nesting banks from predation and from trampling by herbivores;
- recommence and maintain hatchery programs to supplement recruitment of hatchlings into the population;
- modify water infrastructure design and/or operation to minimise mortality of adult turtles during flood events and water releases and ensure that the design of any subsequent infrastructure also minimises such mortality;
- ensure that water planning includes allocation for flows that maintain water quality sufficiently good to allow cloacal respiration, particularly during low flow periods; and
- raise awareness of white-throated snapping turtles within the local community (Threatened Species Scientific Committee 2014).

Recovery actions that have been identified by DES include:

- protection of breeding areas from feral animals, native predators and cattle;
- operation of Biggenden Turtle Hatchery (not currently operational); and
- establishment of 'turtleways' at dams and weirs.

### *Occurrence In and Surrounding the Project Site*

The nearest confirmed record of white-throated snapping turtle (Connor River north of Lotus Creek, Atlas of Living Australia 2018) is over 80 km (straight-line distance) from the Project Site, and the Queensland Wildlife Online database does not have any records of occurrences of this species within 50 km of the Project Site. The absence of records of white-throated snapping turtle in and surrounding the Project Site (and the wider Isaac River Sub-basin) is consistent with the reported habitat preferences of the species (i.e. permanent, flowing water). It is considered that the nearest likely population of white-throated snapping turtle is near the confluence of the Isaac River and Connors River, some 70 km (straight-line distance) downstream from the Project Site, where permanent pools occur and flows are more regular (i.e. flows occur 80% of the time in the Connors River at Pink Lagoon (gauging station 130404A) compared to 27% of the time in the Isaac River at Deverill (gauging station 130410A) (DNRME 2018)).

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# Appendix D Fitzroy River turtle (*Rheodytes leukops*)

## *Description*

Fitzroy River turtles (*Rheodytes leukops*) are distinguished by a white inner ring around the eye, a pale yellow or cream belly, and large, pointed conical tubercles on their shell and neck (Threatened Species Scientific Committee 2008). While few studies have specifically examined the size distribution of this turtle across its range, there are significant differences in the size of adults from populations at different locations (Limpus et al. 2007). These differences were attributed to independent factors (for example, environmental differences between locations) and indicate that Fitzroy River turtle populations are not uniform across the greater Fitzroy River Basin (Limpus et al. 2007).

Adult male Fitzroy River turtles have slightly longer tail length than adult females (Limpus et al. 2007). Carapace length alone is not a reliable indication of sex, as there is considerable overlap in the size ranges of adult males and females; however, when used in conjunction with tail length (beyond the carapace), adults can be assigned to a sex with relative certainty (Limpus et al. 2007). In general, adult males have an approximate straight carapace length range of 20 cm to 26 cm, while adult females have an approximate range of 20–28 cm (Limpus et al. 2007).

## *Status Under Commonwealth and State Legislation*

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

## *Distribution*

The Fitzroy River turtle is restricted to the Fitzroy River Basin (Threatened Species Scientific Committee 2008). The species occurs in permanent freshwater rivers from the Fitzroy Barrage to Theodore Weir and Duck Ponds, upstream of the Comet-Mackenzie River confluence, as well as through Marlborough Creek (Limpus et al. 2007). It has also been found in isolated permanent waterholes on the Connors River (Limpus et al. 2007; frc environmental 2010). The species is not known to inhabit small farm dams or ephemeral waterways (Limpus et al. 2007).

### *Habitat*

Fitzroy River turtles occur in flowing rivers with large deep pools with rocky, gravelly or sandy substrates connected by shallow riffle areas (Cogger et al. 1993; Tucker et al. 2001; Threatened Species Scientific Committee 2008). Riffle zones are an important habitat for the Fitzroy River turtle, with the home ranges of individuals typically overlapping these habitats (Tucker et al. 2001), possibly due to increased foraging success in these habitats (Legler & Cann 1980) or a greater efficiency of respiration in highly oxygenated waters (Priest 1997; Franklin 2000; Gordos et al. 2004). However, under low-flow conditions, or as riffle zones become seasonally ephemeral, the Fitzroy River turtle retreats to deeper pool habitat, or even isolated waterholes, next to riffle zones (Tucker et al. 2001; Limpus et al. 2007).

Riffle zones are likely to be ephemeral throughout most of the range of the Fitzroy River turtle, therefore this species should not be considered a riffle zone specialist (Limpus et al. 2007). Using riffle habitat to forage for abundant food sources such as benthic invertebrates and algae during the wet season and early dry season allows the turtles to take up nutrients and build fat reserves for the dry season, which is essential when preparing to breed (Limpus et al. 2007). Fitzroy River turtles captured from riffle zones tend to be larger than those found in pools and this may be an indicator of better health or condition of turtles in riffle zones, potentially reflecting greater feeding opportunities in riffles (M. Gordos, Conservation Manager, NSW DPI pers. com. July 2007). Therefore, while large, slow-flowing pools can support populations of Fitzroy River turtles these pools are likely to have a lower carrying capacity than reaches containing riffle habitat (Limpus et al. 2007).

### *Ecology*

The age at first breeding for Fitzroy River turtles is approximately 15 to 20 years (Limpus et al. 2011). Females can lay multiple clutches of eggs each year between September and November, averaging 60 to 70 eggs per clutch (EHP 2011; GHD 2015). Female Fitzroy River turtles nest on sandy or loam banks that are free from extensive weeds, and which form during floods (Limpus et al. 2007). Nests are an average of 5.6 m back from the water's edge, with some observed up to 15 m away (Cogger et al. 1993; Cann 1998; Limpus et al. 2007). Eggs are typically laid in deep chambers, with an average depth of 14.7 cm to the top egg and 20.7 cm to the bottom of the nest (Limpus et al. 2007). Nesting success is negatively influenced by habitat degradation and poor health of individuals (Limpus et al. 2007).

Home ranges vary widely among individuals, however, on average, Fitzroy River turtles appear to have a local mean range of 562 m (Tucker et al. 2001). Individual turtles can have long sedentary periods, ranging from 3 to 24 hours. When active, movement is on average 20 m per day, with a range of 0 to 350 m per day (Tucker et al. 2001).

Under low flow events, or as riffle zones became seasonally ephemeral, or dry completely, female Fitzroy River turtles retreat to deeper sections of pool habitats adjacent to riffle zones (Tucker et al. 2001). No seasonal movement patterns have been observed for this species. It has been reported that the current population of Fitzroy River turtles is likely to consist entirely of adults, with no recruitment of juveniles (Norris & Low 2005; Threatened Species Scientific Committee 2008).

### *Threats*

The main threat to Fitzroy River turtle populations is the loss and disturbance of habitat from agriculture, mining, damming of rivers and pollution of habitats (Cogger et al. 1993). Dams and weirs within the Fitzroy River catchment also pose a threat to the preferred habitat of this species as they form large impoundments and reduce the natural condition of riffles throughout the year (Tucker et al. 2001).

Waterway impoundments, such as dams, barrages and weirs, also form significant barriers to the passage of freshwater turtles. The number of dead and injured turtles can be much greater in pools immediately downstream of weirs than in pools distant from weirs, presumably a result of turtles being swept downstream and over impoundments during major and sudden water releases (Hamann et al. 2007).

Predation of eggs by feral (e.g. foxes, dogs, pigs and cats) and native (e.g. water rats and lizards) animals (Threatened Species Scientific Committee 2008) is also a significant threat.

### *Recovery Actions*

There is currently no recovery plan for the Fitzroy River turtle; however, recovery actions identified by the Commonwealth and State agencies include:

- feral animal and weed control through eradication or control plans;
- habitat improvement by managing grazing and by managing waterways;
- habitat protection through:

  - stock management in riparian areas;
  - riparian rehabilitation projects;
  - maintenance and protection of nesting banks;
  - maintenance of stream flow and connectivity between impoundments; and
  - improving water quality in the lower Fitzroy River catchment.
- improving recruitment of hatchlings; and
- encouraging boat owners to look out for, and avoid turtles (DotE 2015a).

### *Occurrence In and Surrounding the Project Site*

The nearest confirmed record of Fitzroy River turtle (Connors River near Lotus Creek, Atlas of Living Australia 2018) is over 90 km (straight-line distance) from the Project Site, and the Queensland Wildlife Online database does not have any records of occurrences of this species within 50 km of the Project Site. The absence of Fitzroy River turtle from in and surrounding the Project Site (and the wider Isaac River Sub-basin) is consistent with the reported habitat preferences of the species (i.e. permanent water). It is considered that the nearest likely population of Fitzroy River turtle is near the confluence of the Isaac River and Connors River, some 70 km (straight-line distance) downstream from the Project Site, where permanent pools occur and flows are more regular (i.e. flows occur 80% of the time in the Connors River at Pink Lagoon (gauging station 130404A) compared to 27% of the time in the Isaac River at Deverill (gauging station 130410A) (DNRME 2018)).

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Threatened Species Scientific Committee, 2008, Approved Conservation Advice for Rheodytes leukops (Fitzroy Tortoise), http://www.environment.gov.au/biodiversity/threatened/species/pubs/1761-conservation-advice.pdf, accessed March 2018.

Tucker, A.D., Limpus, C.J., Priest, T.E., Cay, J., Glen, C. & Guarino, E., 2001, 'Home ranges of Fitzroy River turtles (Rheodytes leukops) overlap riffle zones: potential concerns related to river regulation', Biological Conservation 102: 171-181.

# Appendix E MSES Search Results

Queensland Government

**Department of Environment and Science**

Environmental Reports

# Matters of State Environmental Significance

For the selected area of interest
Longitude: 148.314 Latitude: -22.3759 with 2 kilometre radius

# Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

# Disclaimer

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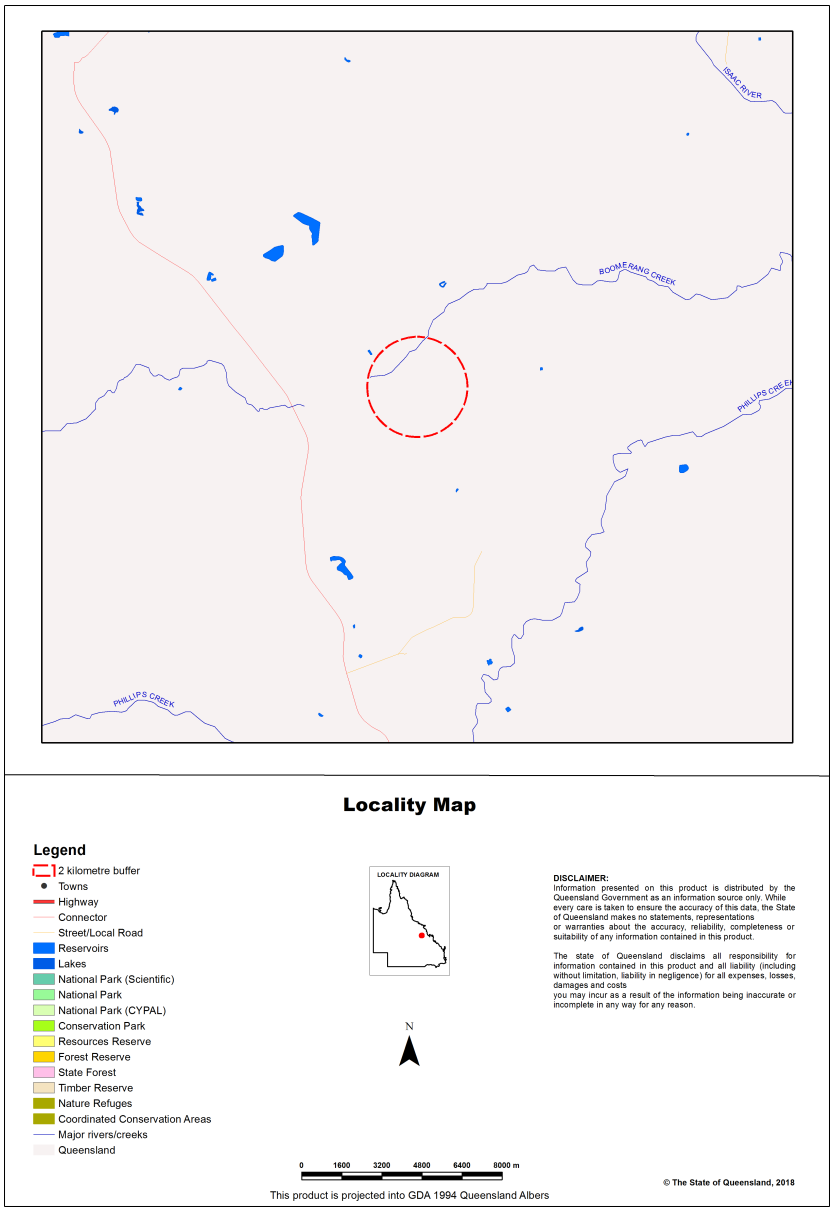
# Table of Contents

# Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

**Table 1: Summary table, details for AOI Longitude: 148.314 Latitude: -22.3759 with 2 kilometre radius**

| | |
|---|---|
| Size (ha) | 1,256.55 |
| Local Government(s) | Isaac Regional |
| Bioregion(s) | Brigalow Belt |
| Subregion(s) | Isaac - Comet Downs |
| Catchment(s) | Fitzroy |



# Matters of State Environmental Significance (MSES)

## MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992* ;

- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004* ;

- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;

- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

    • Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;

    • Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;

    • Category R areas on the regulated vegetation management map;

    • Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;

    • Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Referable Wetlands under the Environmental Protection Regulation 2008;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;

- Legally secured offset areas.

# MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

**Table 2: Summary of MSES present within the AOI**

| | | |
|---|---|---|
| 1a Protected Areas- estates | 0.0 ha | 0.0 % |
| 1b Protected Areas- nature refuges | 0.0 ha | 0.0 % |
| 2 State Marine Parks- highly protected zones | 0.0 ha | 0.0 % |
| 3 Fish habitat areas (A and B areas) | 0.0 ha | 0.0 % |
| 4 Strategic Environmental Areas (SEA) | 0.0 ha | 0.0 % |
| 5 High Ecological Significance wetlands on the map of Referable Wetlands | 0.0 ha | 0.0 % |
| 6a High Ecological Value (HEV) wetlands | 0.0 ha | 0.0 % |
| 6b High Ecological Value (HEV) waterways ** | 0.0 km | Not applicable |
| 7 Threatened species and Iconic species | 85.31 ha | 6.8% |
| 8a Regulated Vegetation - Endangered/Of concern in Category B (remnant) | 215.58 ha | 17.2% |
| 8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth) | 0.0 ha | 0.0 % |
| 8c Regulated Vegetation - Category R (GBR riverine regrowth) | 0.0 ha | 0.0 % |
| 8d Regulated Vegetation - Essential habitat | 85.31 ha | 6.8% |
| 8e Regulated Vegetation - intersecting a watercourse ** | 3.7 km | Not applicable |
| 8f Regulated Vegetation - within 100m of a Vegetation Management Wetland | 0.0 ha | 0.0 % |
| 9a Legally secured offset areas- offset register areas | 0.0 ha | 0.0 % |
| 9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation | 0.0 ha | 0.0 % |

# Additional Information with Respect to MSES Values Present

## MSES - State Conservation Areas

**1a. Protected Areas - estates**

(no results)

**1b. Protected Areas - nature refuges**

(no results)

**2. State Marine Parks - highly protected zones**

(no results)

**3. Fish habitat areas (A and B areas)**

(no results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

## MSES - Wetlands and Waterways

**4. Strategic Environmental Areas (SEA)**

(no results)

**5. High Ecological Significance wetlands on the Map of Referable Wetlands**

(no results)

**6a. High Ecological Value (HEV) waters - wetlands**

(no results)

**6b. High Ecological Value (HEV) waters - waterways**

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

## MSES - Species

**7. Threatened wildlife and special least concern animal**

| Threatened species and iconic species | Act | Species least concern animal | Koala Bushland Habitat | Dugong Protection | VMA Essential 2014 Habitat |
|---|---|---|---|---|---|
| Threat wildlife & Spec LeastC animals | NCA, VMA | None | None | None | Essential |

**Threatened and special least concern species records**

(no results)

Note: The Threatened and Special Least Concern Animal (7) layer originates from the previous MSES version (4.1, dated at 2014). The layer does not represent all currently listed species and is subject to review.

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

To request a species list for an area, or search for a species profile, access Wildlife Online at:
https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3 - MSES - Species** for an overview of the relevant MSES.

## MSES - Regulated Vegetation

**8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)**

| Regional ecosystem | Vegetation management polygon | Vegetation management status |
|---|---|---|
| 11.4.9/11.4.8 | E-dom | rem_end |
| 11.3.2/11.3.25/11.3.1 | E-subdom | rem_end |

**8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)**

Not applicable

For further information relating to regional ecosystems in general, go to:
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/
For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:
https://environment.ehp.qld.gov.au/regional-ecosystems/

**8c. Regulated Vegetation - Category R (GBR riverine regrowth)**

Not applicable

**8d. Regulated Vegetation - Essential habitat**

Values are present

**8e. Regulated Vegetation - intersecting a watercourse****

A vegetation management watercourse is mapped as present

**8f. Regulated Vegetation - within 100m of a Vegetation Management wetland**

Not applicable

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

**MSES - Offsets**

**9a. Legally secured offset areas - offset register areas**

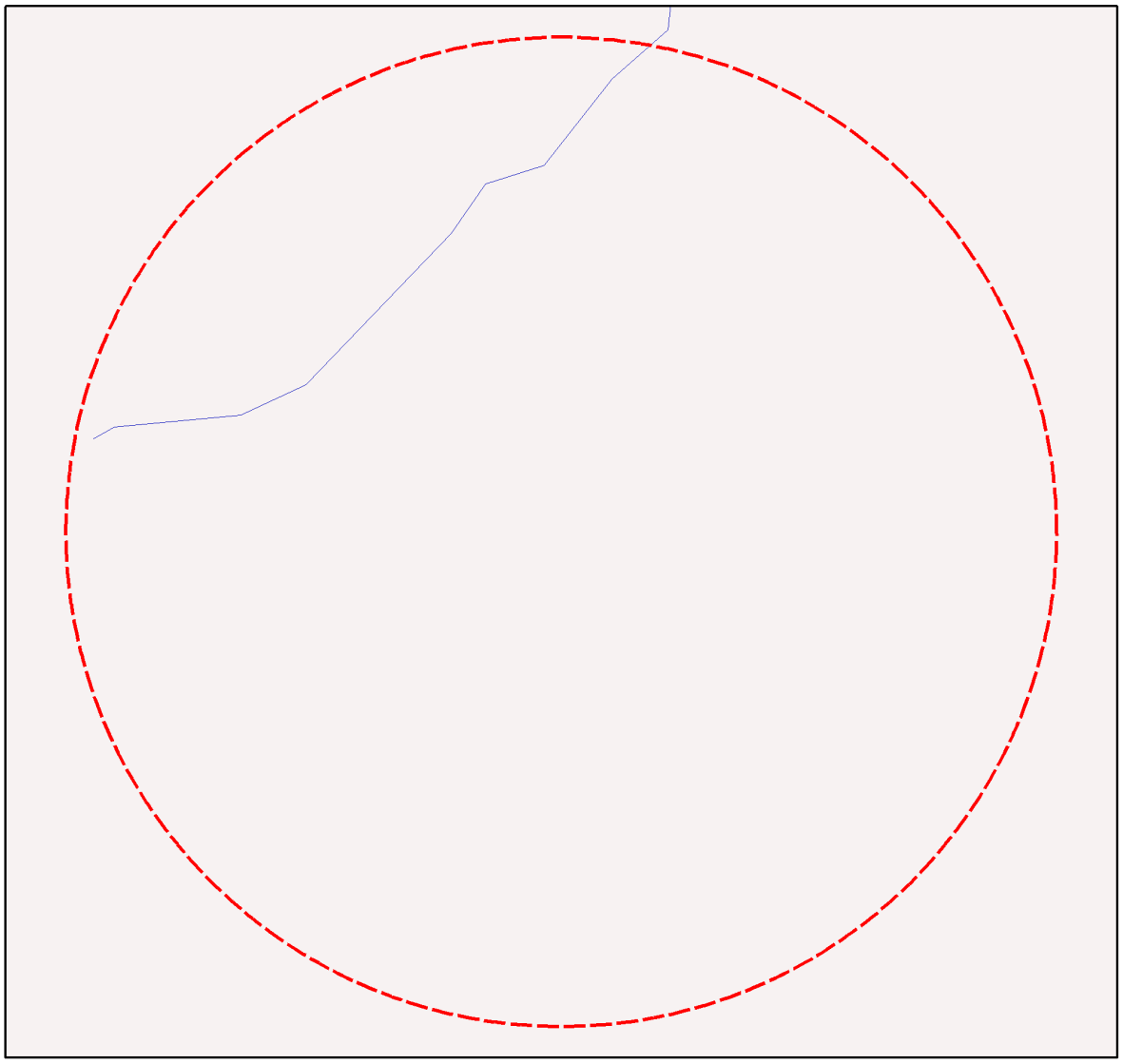
(no results)

**9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation**

(no results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

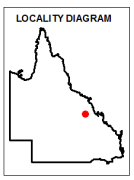
# Map 1 - MSES - State Conservation Areas



## MSES - State Conservation Areas

**Area of Interest**

- 2 kilometre buffer
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)

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N

0 240 480 720 960 1200 m

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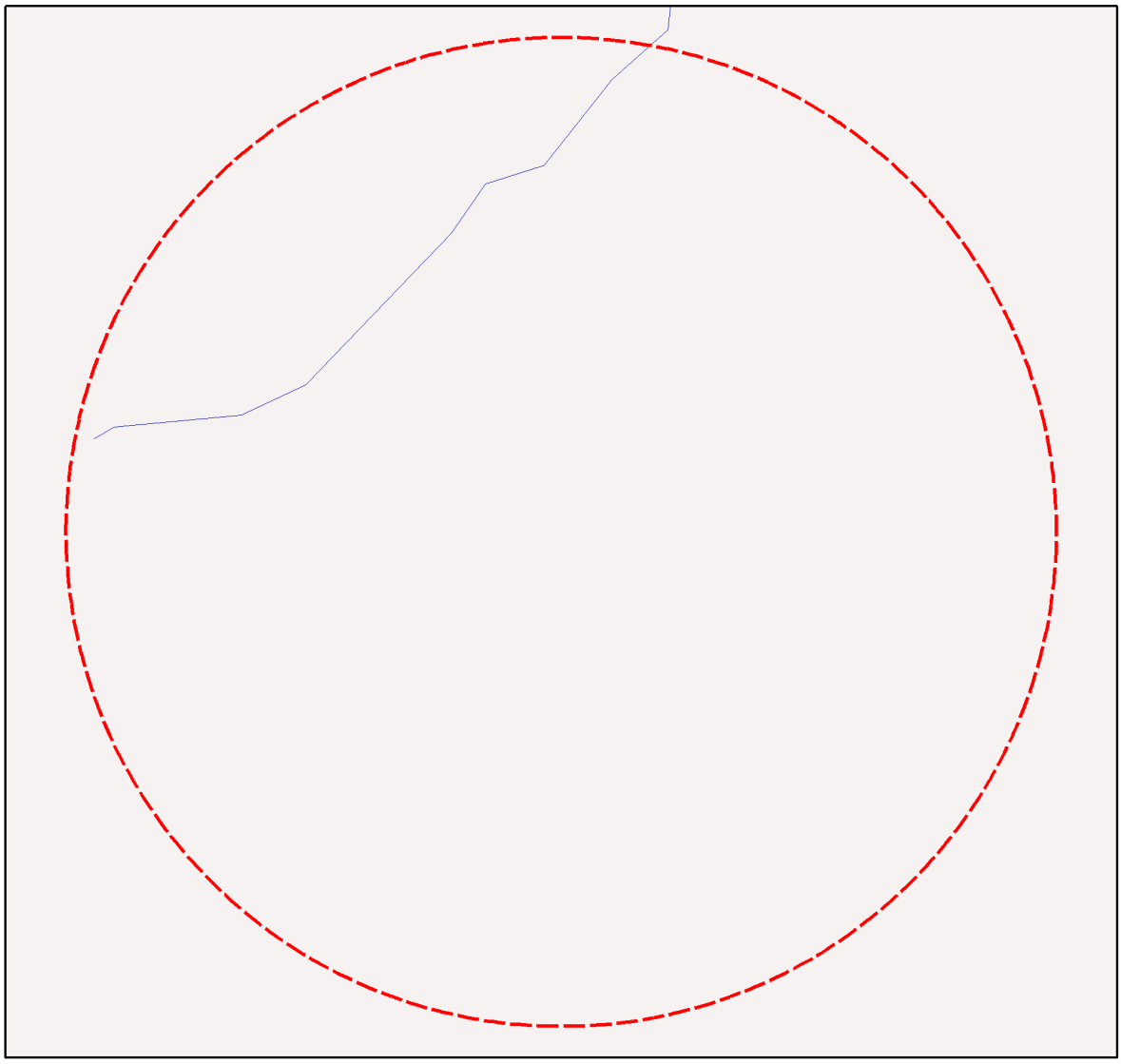
# Map 2 - MSES - Wetlands and Waterways

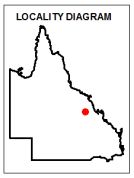


## MSES - Wetlands and Waterways

**Area of Interest**

- 2 kilometre buffer
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Declared high ecological value waters (watercourse)
- Strategic environmental area (designated precinct)
- Declared high ecological value waters (wetland)
- High ecological significance wetlands

LOCALITY DIAGRAM



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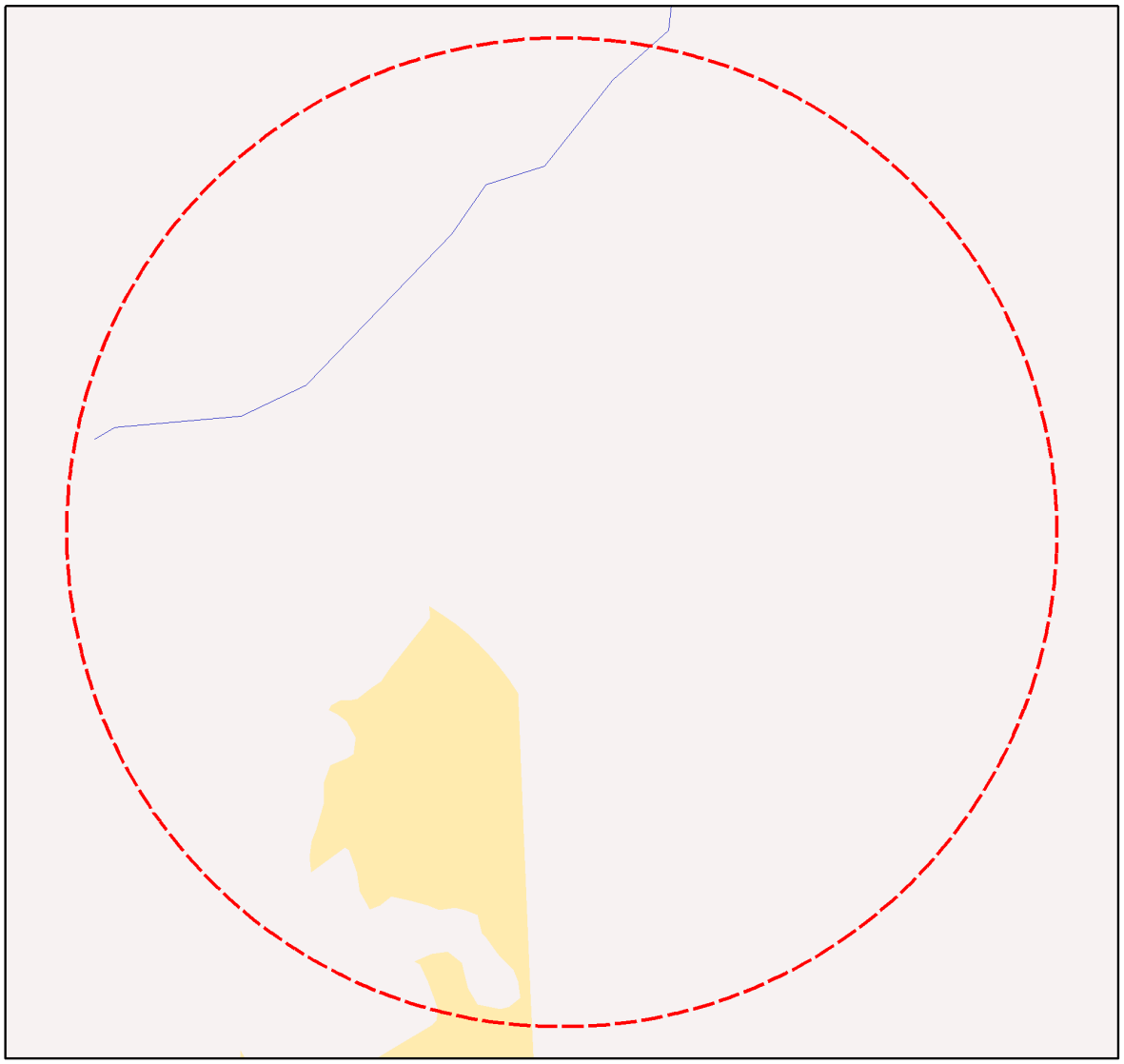
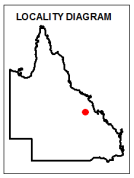
# Map 3 - MSES - Species



## MSES - Species

**Area of Interest**

- 2 kilometre buffer
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Threatened wildlife and special least concern animal

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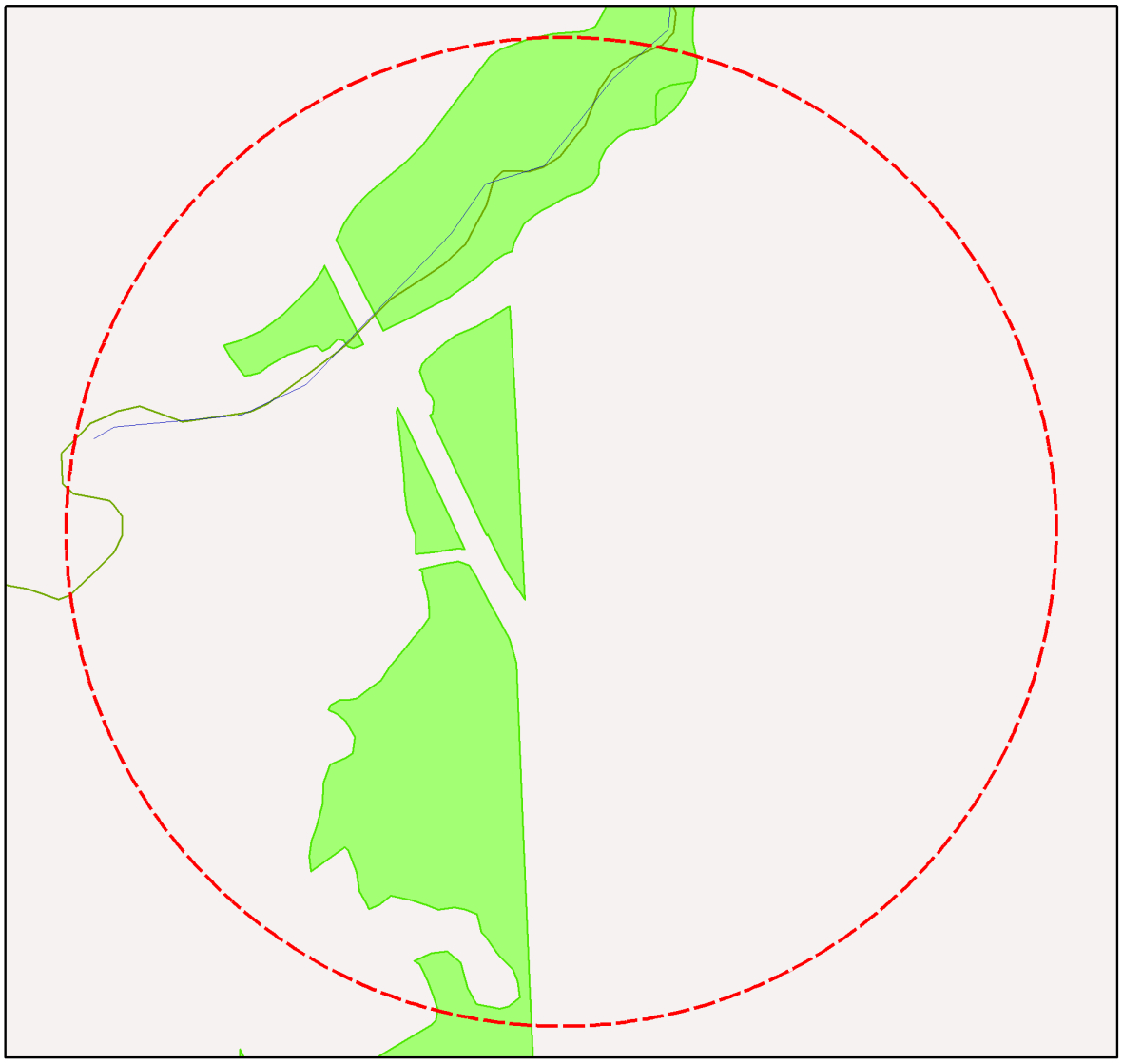
# Map 4 - MSES - Regulated Vegetation

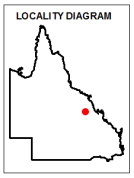


## MSES - Regulated Vegetation

**Area of Interest**

- 2 kilometre buffer
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)

LOCALITY DIAGRAM



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0 240 480 720 960 1200 m

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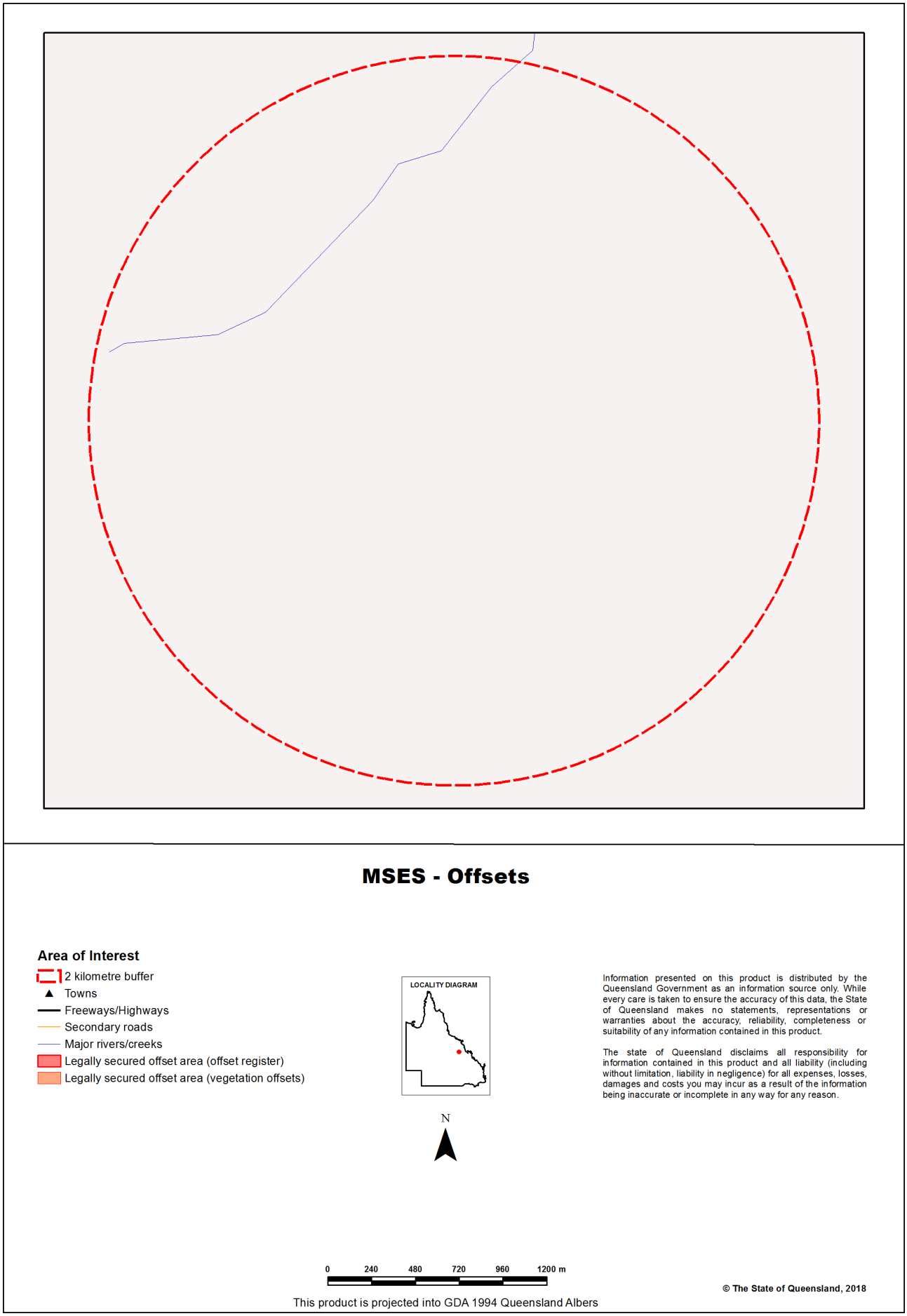
# Map 5 - MSES - Offset Areas



# Appendices

## Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

# Appendix 2 - Source Data

**The datasets listed below are available on request from:**

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

| **MSES layers** | **current QSpatial data (http://qspatial.ingormation.qld.gov.au)** |
|---|---|
| Protected Areas-Estates and Nature Refuges | - Protected areas of Queensland<br>- Nature Refuges - Queensland |
| Marine Park-Highly Protected Zones | Moreton Bay marine park zoning 2008 |
| Fish Habitat Areas | Queensland fish habitat areas |
| Strategic Environmental Areas-designated | Regional Planning Interests Act - Strategic Environmental Areas |
| HES wetlands | Map of Referable Wetland - wetland layers:<br>- Wetland management area wetlands<br>- Wetland protection area wetlands |
| wetlands in HEV waters | HEV waters:<br>- EPP Water (multiple locations) intent for waters<br>Source Wetlands:<br>- Queensland Wetland Mapping (Current version 4, 2015)<br>Source Watercourses:<br>- Vegetation management watercourse and drainage feature map (1:100000 and 1:250000) - latest version 1.4 |
| Wildlife habitat (threatened and special least concern) | -WildNet database species records<br>- habitat suitability models (various) |
| VMA regulated regional ecosystems | Vegetation management regional ecosystem and remnant map - latest version 8.0 |
| VMA Essential Habitat | Vegetation management - essential habitat map - latest version 4.41 |
| VMA Wetlands | Vegetation management wetlands map - latest version 2.41 |
| Legally secured offsets | Vegetation Management Act property maps of assessable vegetation.<br>For offset register data-contact DES |
| Regulated Vegetation Map | Vegetation management - regulated vegetation management map - latest version 1.41 |

# Appendix 3 - Acronyms and Abbreviations

| | |
|---|---|
| AOI | - Area of Interest |
| DES | - Department of Environment and Science |
| EP Act | - *Environmental Protection Act 1994* |
| EPP | - Environmental Protection Policy |
| GDA94 | - Geocentric Datum of Australia 1994 |
| GEM | - General Environmental Matters |
| GIS | - Geographic Information System |
| MSES | - Matters of State Environmental Significance |
| NCA | - *Nature Conservation Act 1992* |
| RE | - Regional Ecosystem |
| SPP | - State Planning Policy |
| VMA | - *Vegetation Management Act 1999* |