

# Appendix E4 – Aquatic Flora and Fauna



**Gladstone Area  
Water Board**



# Queensland Government

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## Environmental Protection Agency Queensland Parks and Wildlife Service

### Wildlife Online Extract

Search Criteria: Species List for a Defined Area  
Species: Plants (including other non-animals such as fungi and protists)  
Type: All  
Status: Rare and threatened species  
Records: All  
Date: All  
Latitude: 23.26 to 23.89  
Longitude: 150.4 to 150.8  
Email: dcjohnson@wbmpl.com.au  
Date submitted: Tuesday 07 Aug 2007 16:58:54  
Date extracted: Tuesday 07 Aug 2007 17:01:27

The number of records retrieved = 22

### **Disclaimer**

As the EPA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	cycads	Cycadaceae	<i>Cycas megacarpa</i>			E	E	22/13
plants	cycads	Cycadaceae	<i>Cycas ophiolitica</i>	Marlborough blue		E	E	14/14
plants	higher dicots	Acanthaceae	<i>Graptophyllum excelsum</i>			R		8/5
plants	higher dicots	Apocynaceae	<i>Alyxia magnifolia</i>			R		2
plants	higher dicots	Apocynaceae	<i>Parsonsia lenticellata</i>	narrow-leaved parsonsia		R		4
plants	higher dicots	Asclepiadaceae	<i>Marsdenia brevifolia</i>			V	V	1/1
plants	higher dicots	Combretaceae	<i>Dansiea elliptica</i>			R		1/1
plants	higher dicots	Combretaceae	<i>Macropteranthes leiocaulis</i>			R		10/10
plants	higher dicots	Combretaceae	<i>Macropteranthes fitzalanii</i>			R		1
plants	higher dicots	Euphorbiaceae	<i>Actephila sessilifolia</i>			R		1
plants	higher dicots	Lamiaceae	<i>Callicarpa thozetii</i>			R		1/1
plants	higher dicots	Mimosaceae	<i>Acacia pubicosta</i>			R		1/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus raveretiana</i>	black ironbox		V	V	2/1
plants	higher dicots	Myrtaceae	<i>Decaspermum struckoiligum</i>			E		10/5
plants	higher dicots	Myrtaceae	<i>Choricarpia subargentea</i>	giant ironwood		R		3/1
plants	higher dicots	Proteaceae	<i>Hakea trineura</i>			V	V	1/1
plants	higher dicots	Sapindaceae	<i>Atalaya rigida</i>			R		7/1
plants	higher dicots	Sapindaceae	<i>Cossinia australiana</i>			E	E	4
plants	higher dicots	Sapindaceae	<i>Atalaya calcicola</i>			R		5/4
plants	higher dicots	Stackhousiaceae	<i>Stackhousia tryonii</i>			R		4/4
plants	lower dicots	Hernandiaceae	<i>Hernandia bivalvis</i>	cudgerie		R		10/3
plants	monocots	Arecaceae	<i>Livistona drudei</i>	Halifax fan palm		V		1

#### CODES

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

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C) or Not Protected ( ).

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

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

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



# Queensland Government

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## Environmental Protection Agency

### Queensland Parks and Wildlife Service

#### Wildlife Online Extract

Search Criteria: Species List for a Defined Area  
Species: Plants (including other non-animals such as fungi and protists)  
Type: All  
Status: Rare and threatened species  
Records: All  
Date: All  
Latitude: 23.26 to 23.89  
Longitude: 150.8 to 151.22  
Email: dcjohnson@wbmpl.com.au  
Date submitted: Tuesday 07 Aug 2007 16:59:43  
Date extracted: Tuesday 07 Aug 2007 17:01:46

The number of records retrieved = 20

#### **Disclaimer**

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	cycads	Cycadaceae	<i>Cycas megacarpa</i>			E	E	3/2
plants	ferns	Aspleniaceae	<i>Asplenium pellucidum</i>			V	V	2
plants	higher dicots	Acanthaceae	<i>Graptophyllum excelsum</i>			R		7/2
plants	higher dicots	Apocynaceae	<i>Alyxia magnifolia</i>			R		7/2
plants	higher dicots	Apocynaceae	<i>Parsonsia larcomensis</i>			V	V	4/4
plants	higher dicots	Apocynaceae	<i>Parsonsia lenticellata</i>	narrow-leaved parsonsia		R		8
plants	higher dicots	Celastraceae	<i>Denhamia parvifolia</i>			V	V	1
plants	higher dicots	Combretaceae	<i>Dansiea elliptica</i>			R		9/6
plants	higher dicots	Combretaceae	<i>Macropteranthes leiocaulis</i>			R		3/3
plants	higher dicots	Combretaceae	<i>Macropteranthes fitzalanii</i>			R		3/1
plants	higher dicots	Euphorbiaceae	<i>Actephila sessilifolia</i>			R		8/6
plants	higher dicots	Mimosaceae	<i>Acacia storyi</i>			R		2/1
plants	higher dicots	Rutaceae	<i>Philotheca acrolopha</i>			V	V	1
plants	higher dicots	Rutaceae	<i>Zieria sp. (Mt Larcom N.Gibson TO18)</i>			V		4/4
plants	higher dicots	Sapindaceae	<i>Atalaya rigida</i>			R		11/8
plants	higher dicots	Sapindaceae	<i>Atalaya calcicola</i>			R		1/1
plants	higher dicots	Sapindaceae	<i>Cupaniopsis shirleyana</i>			V	V	10/8
plants	higher dicots	Sapindaceae	<i>Atalaya collina</i>			E	E	3/2
plants	higher dicots	Simaroubaceae	<i>Quassia bidwillii</i>	quassia		V	V	2/2
plants	lower dicots	Hernandiaceae	<i>Hernandia bivalvis</i>	cudgerie		R		8/4

#### CODES

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

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C) or Not Protected ( ).

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

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

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

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Protected Matters Search Tool

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17 April 2007 15:41

## 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.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at <http://www.environment.gov.au/atlas> may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

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### Map of Search Region including any Buffer

This map may contain data which are  
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(Geoscience Australia)  
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**Search Type:** Area

**Buffer:** 0 km

**Coordinates:** -23.4015,150.4725, -23.4218,150.5206, -23.4724,150.5788, -23.5610,150.6345,  
-23.6192,150.6674, -23.6470,150.7205, -23.6571,150.7914, -23.7179,150.8800,  
-23.7634,150.9610, -23.7913,151.0091, -23.8039,151.0825, -23.8039,151.1280,  
-23.8267,151.1634, -23.8571,151.1609, -23.8799,151.1154, -23.8925,151.0698,  
-23.8900,151.0015, -23.8394,150.9357, -23.7837,150.8547, -23.7331,150.7788,  
-23.7078,150.6927, -23.6673,150.6168, -23.6015,150.5586, -23.5281,150.5181,  
-23.452,150.4877

Thumbnail Map of Search Region

**Report Contents:** [Summary](#)

[Details](#)

- [Matters of NES](#)
- [Other matters protected by the EPBC Act](#)
- [Extra Information](#)

[Caveat](#)  
[Acknowledgments](#)

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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 - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

<b>World Heritage Properties:</b>	None
<b>National Heritage Places:</b>	None
<b><u>Wetlands of International Significance:</u></b> <b>(Ramsar Sites)</b>	1
<b>Commonwealth Marine Areas:</b>	None
<b><u>Threatened Ecological Communities:</u></b>	2
<b><u>Threatened Species:</u></b>	24
<b><u>Migratory Species:</u></b>	18

### 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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

<b>Commonwealth Lands:</b>	None
<b>Commonwealth Heritage Places:</b>	None
<b>Places on the RNE:</b>	None
<b><u>Listed Marine Species:</u></b>	17
<b>Whales and Other Cetaceans:</b>	None
<b>Critical Habitats:</b>	None
<b>Commonwealth Reserves:</b>	None

## Extra Information

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

<b>State and Territory Reserves:</b>	None
<b>Other Commonwealth Reserves:</b>	None
<b><u>Regional Forest Agreements:</u></b>	1

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## Details

## Matters of National Environmental Significance

Wetlands of International Significance [ [Dataset Information](#) ]  
(Ramsar Sites)

<b><u>SHOALWATER AND CORIO BAYS AREA</u></b>		Within same catchment as Ramsar site
Threatened Ecological Communities [ <a href="#">Dataset Information</a> ]	Status	Type of Presence
<b><u>Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)</u></b>	Endangered	Community known to occur within area
<b><u>Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions</u></b>	Endangered	Community likely to occur within area
Threatened Species [ <a href="#">Dataset Information</a> ]	Status	Type of Presence
<b>Birds</b>		
<b><u><i>Epthianura crocea macgregori</i></u>*</b> Yellow Chat (Dawson)	Critically Endangered	Species or species habitat known to occur within area
<b><u><i>Erythrotriorchis radiatus</i></u>*</b> Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
<b><u><i>Geophaps scripta scripta</i></u>*</b> Squatter Pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area
<b><u><i>Neochmia ruficauda ruficauda</i></u>*</b> Star Finch (eastern), Star Finch (southern)	Endangered	Species or species habitat likely to occur within area
<b><u><i>Rostratula australis</i></u>*</b> Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area



[\*Turnix melanogaster\*](#) \*  
Black-breasted Button-quail

Vulnerable Species or species habitat likely to occur within area

### Mammals

[\*Chalinolobus dwyeri\*](#) \*  
Large-eared Pied Bat, Large Pied Bat

Vulnerable Species or species habitat may occur within area

[\*Dasyurus hallucatus\*](#) \*  
Northern Quoll

Endangered Species or species habitat may occur within area

[\*Nyctophilus timoriensis \(South-eastern form\)\*](#) \*  
Eastern Long-eared Bat

Vulnerable Species or species habitat may occur within area

[\*Xeromys myoides\*](#) \*  
Water Mouse, False Water Rat

Vulnerable Species or species habitat likely to occur within area

### Reptiles

[\*Denisonia maculata\*](#) \*  
Ornamental Snake

Vulnerable Species or species habitat likely to occur within area

[\*Egernia rugosa\*](#) \*  
Yakka Skink

Vulnerable Species or species habitat likely to occur within area

[\*Furina dunmali\*](#) \*  
Dunmall's Snake

Vulnerable Species or species habitat may occur within area

[\*Paradelma orientalis\*](#) \*  
Brigalow Scaly-foot

Vulnerable Species or species habitat likely to occur within area

[\*Rheodytes leukops\*](#) \*  
Fitzroy Tortoise

Vulnerable Species or species habitat may occur within area

### Plants

[\*Atalaya collina\*](#) \*

Endangered Species or species habitat likely to occur within area

[\*Bosistoa selwynii\*](#) \*  
Heart-leaved Bosistoa

Vulnerable Species or species habitat likely to occur within area

[\*Bosistoa transversa\*](#) \*  
Three-leaved Bosistoa

Vulnerable Species or species habitat likely to occur within area

[\*Bulbophyllum globuliforme\*](#) \*  
Miniature Moss-orchid

Vulnerable Species or species habitat likely to occur within area

[\*Cupaniopsis shirleyana\*](#) \*  
Wedge-leaf Tuckeroo

Vulnerable Species or species habitat likely to occur within area

[\*Eucalyptus raveretiana\*](#) \*  
Black Ironbox

Vulnerable Species or species habitat likely to occur within area

[\*Leucopogon cuspidatus\*](#) \*

Vulnerable Species or species habitat likely to occur within area

[\*Parsonsia larcomensis\*](#) \*

Vulnerable Species or species habitat likely to occur within area

[\*Quassia bidwillii\*](#) \*  
Quassia

Vulnerable Species or species habitat likely to occur within area

Migratory Species [ [Dataset Information](#) ]

Status Type of Presence

### Migratory Terrestrial Species

**Birds**

[Haliaeetus leucogaster](#)  
White-bellied Sea-Eagle

Migratory Species or species habitat likely to occur within area

[Hirundapus caudacutus](#)  
White-throated Needletail

Migratory Species or species habitat may occur within area

[Hirundo rustica](#)  
Barn Swallow

Migratory Species or species habitat may occur within area

[Merops ornatus](#) \*  
Rainbow Bee-eater

Migratory Species or species habitat may occur within area

[Monarcha melanopsis](#)  
Black-faced Monarch

Migratory Breeding may occur within area

[Monarcha trivirgatus](#)  
Spectacled Monarch

Migratory Breeding likely to occur within area

[Myiagra cyanoleuca](#)  
Satin Flycatcher

Migratory Species or species habitat likely to occur within area

[Rhipidura rufifrons](#)  
Rufous Fantail

Migratory Breeding may occur within area

**Migratory Wetland Species****Birds**

[Ardea alba](#)  
Great Egret, White Egret

Migratory Species or species habitat may occur within area

[Ardea ibis](#)  
Cattle Egret

Migratory Species or species habitat may occur within area

[Gallinago hardwickii](#) \*  
Latham's Snipe, Japanese Snipe

Migratory Species or species habitat may occur within area

[Nettapus coromandelianus albipennis](#)  
Australian Cotton Pygmy-goose

Migratory Species or species habitat may occur within area

[Numenius minutus](#)  
Little Curlew, Little Whimbrel

Migratory Species or species habitat may occur within area

[Rostratula benghalensis s. lat.](#)  
Painted Snipe

Migratory Species or species habitat may occur within area

**Migratory Marine Birds**

[Apus pacificus](#)  
Fork-tailed Swift

Migratory Species or species habitat may occur within area

[Ardea alba](#)  
Great Egret, White Egret

Migratory Species or species habitat may occur within area

[Ardea ibis](#)  
Cattle Egret

Migratory Species or species habitat may occur within area

**Migratory Marine Species****Reptiles**

[Crocodylus porosus](#)  
Estuarine Crocodile, Salt-water Crocodile

Migratory Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

Listed Marine Species [ <a href="#">Dataset Information</a> ]	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anseranas semipalmata</a> Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Ardea ibis</a> Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a> * Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Hirundo rustica</a> Barn Swallow	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> * Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch	Listed - overfly marine area	Breeding may occur within area
<a href="#">Monarcha trivirgatus</a> Spectacled Monarch	Listed - overfly marine area	Breeding likely to occur within area

<a href="#"><u><i>Myiagra cyanoleuca</i></u></a> Satin Flycatcher	Listed - overfly marine area	Species or species habitat likely to occur within area
<a href="#"><u><i>Nettapus coromandelianus albipennis</i></u></a> Australian Cotton Pygmy-goose	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#"><u><i>Numenius minutus</i></u></a> Little Curlew, Little Whimbrel	Listed - overfly marine area	Species or species habitat may occur within area
<a href="#"><u><i>Rhipidura rufifrons</i></u></a> Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
<a href="#"><u><i>Rostratula benghalensis s. lat.</i></u></a> Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#"><u><i>Crocodylus porosus</i></u></a> Estuarine Crocodile, Salt-water Crocodile	Listed	Species or species habitat likely to occur within area

## Extra Information

Regional Forest Agreements [ [Dataset Information](#) ]

Note that all RFA areas including those still under consideration have been included.

South East Queensland RFA, Queensland

## 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 Heritage and Register of National Estate properties, Wetlands of International 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 [migratory](#) and [marine](#) provisions of the Act have been mapped.

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.

## Acknowledgments

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

- [New South Wales National Parks and Wildlife Service](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Water and Environment, Tasmania](#)
- [Department of Environment and Heritage, South Australia Planning SA](#)
- [Parks and Wildlife Commission of the Northern Territory](#)
- [Environmental Protection Agency, Queensland](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [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](#)
- Other groups and individuals

[ANUcliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University](#)

was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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GPO Box 787 Canberra ACT 2601 Australia

Telephone: +61 (0)2 6274 1111

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## Appendix E.4 - Detailed Aquatic Site Habitat Features

### *Fitzroy to Bajool Section of the Project Area*

A detailed assessment of the aquatic habitat features at each site was undertaken following the methodology described in Section 8.2.3 of the EIS. Water quality measurements were recorded at sites that had water depths > 0.3 m at the time of the surveys (Fitzroy River, Lagoon 1, Lagoon 2) and are presented in Table.1. The key findings of the aquatic habitat assessments are summarised here.

#### *Site 1 – Fitzroy River*

- This site was the largest and deepest waterbody within the project area (max. depth approx. 11 m).
- Bed sediments were comprised of fine silts.
- At the intake site, the bank had been excavated to form an artificial pool, which had a dense cover of the noxious Water Hyacinth\* (*Eichhornia crassipes*). No other aquatic macrophytes were recorded within this area, although semi-aquatic grasses fringed the waterway.
- Riparian vegetation, both the overstorey and understorey, was sparse.
- Temperature was slightly lower (17°C) in deeper waters than in surface waters (20°C). Deeper waters (7–11 m) also had lower dissolved oxygen concentrations (2.2–4.4 mg/L) compared to shallower waters (5.7–6.8 mg/L), indicating weak stratification. Turbidity was high (> 118 NTU) at all depths (Table.1). These water quality conditions are typical of those found in perennial reaches elsewhere within the Fitzroy River system (Queensland Government web-based Watershed data; Noble and Rummenie 1996). The high turbidity in this river reach would greatly inhibit phytoplankton primary productivity, and would prevent the establishment of dense beds of submergent macrophytes in water depths > 1–2 m.

#### *Sites 2 & 4 – Lagoons 1 and 2*

- These sites were unnamed lagoons, and have been designated Lagoon 1 and Lagoon 2. Lagoon 1 was a shallow (< 0.5 m) off-stream lagoon that at the time of sampling was 560 m long by 63 m wide. Lagoon 2 was smaller off-stream pool, which at the time of sampling was 100 m long by 25 m wide, with a mean depth of 0.4 m
- The substrate of both lagoons was mostly comprised of moderately compacted fine silts and clays, with a thin layer of unconsolidated silts and fine organic matter.
- Lagoon 1 was highly turbid (~589 NTU), most likely a result of disturbance of bed sediments by cattle. In contrast, Lagoon 2 was relatively clear (turbidity ~14.5 NTU), although salinity at this site was slightly higher than at other freshwater systems sampled within the project area.

- At both locations the banks and surrounds had been cleared for agriculture and there was no riparian tree vegetation present. Both sites had limited habitat structure and were dominated by dense growth of the invasive weed species Fireweed (*Senecio madagascariensis*\*) throughout the riparian zone.
- Lagoon 1 had extensive areas of emergent macrophytes, but no submergent or floating macrophytes were recorded. No aquatic macrophytes were recorded at Lagoon 2. Physical disturbance by cattle, high turbidity (particularly at Lagoon 1), and fluctuating lagoon water levels, are likely to prevent the development of submergent and floating aquatic macrophytes within these lagoons.

#### Site 3 – Lion Creek

- Lion Creek is an ephemeral drainage, which at the time of sampling, did not contain surface water. A small (approximately 50 m long) ephemeral pool/floodway, with very low habitat values, was present approximately 200 m away from the proposed corridor route, but would not be directly affected by the project.
- Stream bed sediments consisted of compacted clays and silts. No aquatic macrophyte and little riparian vegetation were present, with surrounding lands mostly cleared for grazing. The weed species Parthenium (*Parthenium hysterophorus*\*) and Fireweed (*Senecio madagascariensis*\*) formed a dense cover on both banks.

#### Site 5 – Gavial Creek

- Although dry at the time of sampling, anecdotal evidence suggests that Gavial Creek is historically comprised of a series of intermittently connected in-stream pools, which also connect to off-stream wetlands during large floods. Due to access restrictions, rapid site inspections were undertaken from adjoining public lands.
- Habitat conditions varied markedly along the site, reflecting different levels of habitat disturbance. Structural habitats had moderate habitat complexity (good woody debris cover) in places.
- The surrounding land has been cleared for agriculture, although a narrow and fragmented band of riparian (~5 m) vegetation (*Eucalyptus* species) was present on both banks.
- All banks were highly eroded and had slumped into the creek, which was more notable in upstream areas near the pipeline corridor.
- No aquatic macrophytes were observed at the time of site inspections.

#### Sites 6 & 7 – Station and Oakey Creeks

- Station Creek is an ephemeral stream characterised by a narrow, deep, undulating channel with the potential for riffle and pool habitats during periods of flow. Both Station and Oakey Creeks were dry at the time of sampling.



- At Station Creek channel habitat diversity was high, with ~30% cover of in-stream large woody debris, ~80% cover of leaf litter, and areas of bank undercutting with exposed root masses. Bed substrates were comprised of compacted clays with ~5% rounded cobbles/large gravel and riparian vegetation was semi-continuous and narrow, dominated by *Eucalyptus* species and Weeping Bottle Brush (*Callistemon viminalis*).
- At Oakey Creek a narrow, semi-continuous riparian zone extended along both creek banks, and was dominated by Weeping Bottle Brush (*Callistemon viminalis*). Stream banks were severely eroded in places, and the substrate was comprised of a compacted sand (~80%) and cobble/pebble (~20%) matrix.

**Table.1 Physio-chemical water quality parameters of waterways within the Fitzroy to Bajool section of the project area**

Site	Date D/M/Y	Time hh:mm	Temp °C	Conductivity µS/cm	Salinity ppt	DO mg/L	Depth m	pH	Turbidity NTU
Fitzroy River	25.08.07	10:00	20.02	257	0.07	6.8	Surface	7.06	118
Fitzroy River	25.08.07	10:00	19.25	221	0.05	6.8	1	7.12	127.1
Fitzroy River	25.08.07	10:00	19.15	222	0.05	6.7	2	7.15	123.3
Fitzroy River	25.08.07	10:00	19.11	222	0.04	6.6	3	7.16	120.7
Fitzroy River	25.08.07	10:00	19.06	218	0.04	6.5	4	7.14	124.4
Fitzroy River	25.08.07	10:00	19.02	219	0.04	6.3	5	7.13	123.5
Fitzroy River	25.08.07	10:00	18.62	217	0.04	5.7	6	7.06	130.9
Fitzroy River	25.08.07	10:00	17.52	219	0.04	4.4	7	6.97	158.1
Fitzroy River	25.08.07	10:00	17.24	220	0.04	3.5	8	6.92	166.1
Fitzroy River	25.08.07	10:00	17.24	220	0.04	3.2	9	6.89	-
Fitzroy River	25.08.07	10:00	17.25	220	0.04	3	10	6.87	-
Fitzroy River	25.08.07	10:00	17.3	223	0.04	2.2	11	6.86	-
Lagoon 1	24.08.07	9:00	17.51	148	0.03	4.1	Surface	6.81	589.5
Lagoon 1	24.08.07	9:00	18.03	143	0.01	4.5	Surface	6.89	589.5
Lagoon 1	24.08.07	9:00	17.77	143	0.01	4.5	Surface	6.81	589.5
Lagoon 2	24.08.07	12:30	24.18	3434	1.68	6	Surface	7.05	6.2
Lagoon 2	24.08.07	12:30	23.66	3434	1.68	6.4	Surface	7.16	19.6
Lagoon 2	24.08.07	12:30	23.29	3426	1.63	6.3	Surface	7.18	17.8

Note: data has been omitted in places where water depths were too shallow to obtain accurate measurements (denoted by '-').

**Bajool to Gladstone Section of the Project Area**

A detailed assessment of the aquatic habitat features at each site was undertaken following the methodology described in Section **Error! Reference source not found.** Water quality measurements were recorded at all sites containing surface waters at the time of the surveys (i.e. Inkerman, Twelve Mile, Hourigan and Larcom Creeks) and are presented in Table.2. Key points are summarised here and the full habitat descriptions are provided in Appendix G.

#### Site 8 – Inkerman Creek

- Inkerman Creek is a mangrove lined creek surrounded by extensive areas of saltmarsh. Stream banks had a narrow (~5 m), semi-continuous mangrove fringe that was dominated by Milky Mangrove (*Excoecaria agallocha*) and Grey Mangrove (*Avicennia marina*).
- At low tide, the creek had a wetted width < 0.5 m and a depth < 0.2 m.
- The immediate surrounds consisted of either cleared grazing lands. Saltmarsh (dominated by Pigweed (*Portulaca bicolor*)) was present in a secondary channel that would be inundated during high or spring tides.
- Inkerman Creek was hypersaline (60 ppt) and had a high turbidity (375 NTU) at the time of sampling (Table.2). These water quality conditions would be highly stressful to estuarine flora and fauna, reducing waterway habitat values.

#### Site 9 & 10 – Twelve Mile Creek and Marble Creek

- Twelve Mile Creek drains into the coastal salt flats and the lower section of Raglan Creek. The creek and immediate surrounds have been modified by vegetation clearing, ongoing grazing pressures and road and rail infrastructure development.
- The wetted stream width of Twelve Mile Creek was ~14m, and a continuous in-stream pool was present at the time of sampling.
- Riparian vegetation at Twelve Mile Creek was sparse and highly fragmented. Both banks were slightly eroded due to the lack of riparian vegetation and ongoing bank erosion due to stock usage of the creek. Emergent macrophytes occurred in the littoral zone on both banks.
- Twelve Mile Creek was the deepest waterbody sampled in this section of the project area. Creek waters were slightly brackish (~1.8 ppt) with lower dissolved oxygen concentrations near the bed (2.4 mg/L at 2 m depth) compared to surface waters (max. 6.8 mg/L) (Table.2). This would reflect higher levels of anaerobic bacterial activity near the bed compared to surface waters.
- Marble Creek (Site 10) is a tributary of Twelve Mile Creek. The waterway is a low order ephemeral drainage that was dry at the time of sampling. A narrow semi-continuous riparian fringe extended along both banks, and was dominated by *Callistemon* species. Cleared grazing lands surrounded the creek.

#### Site 11 – Pelican Creek

- Pelican Creek was mostly dry at the time of sampling . This site had sparse to no riparian (tree) vegetation on either bank, and the surrounding area consisted of cleared grazing lands.
- The creek bed and banks were highly disturbed, with high levels of erosion and aggradation (i.e. sediment deposition), most likely resulting from cattle usage, observed throughout the waterway.
- Sparse emergent macrophytes (sedge/rush) had a hog cover on both banks.
- A constructed weir was present ~1–2 km downstream of the site, which has resulted in the creation of a large weir pond. This structure also separates the freshwater and estuarine reaches of Pelican Creek. The weir has resulted in aquatic habitat fragmentation and isolation, and is likely to be having a major effect on aquatic fauna movements through the creek.

#### Site 12 & 13 – Raglan Creek and minor tributary Hourigan Creek

- Raglan Creek is a mangrove-lined tidal creek with high aquatic ecosystem values.
- Overall, the creek bed and banks were in good condition. It had a broad (~3 m wide), continuous mangrove fringe on both banks, which was dominated by Milky Mangrove (*Excoecaria agallocha*) and Grey Mangrove (*Avicennia marina*).
- Hourigan Creek is a small tributary of Raglan Creek. Several isolated, shallow (< 0.1 m) pools were present at the time of sampling. These pools had salinities close to seawater (salinity ~36 ppt), however marine vegetation was absent at this site (but most likely occurs downstream). No emergent or submergent vegetation was observed at the time of sampling.
- Bed sediments at Hourigan Creek were predominantly compacted silts. In-stream micro-habitat diversity was high, with large amount of leaf litter, and small and large woody debris, recorded throughout the site. Iron oxide flocs were observed in places, which together with the low pH of creek waters (~5.6 pH, see Table.2), suggests the presence and/or exposure of acid sulfate soils (ASS). Under certain conditions (e.g. following rainfall), the presence of ASS could lead to stressful conditions to resident aquatic flora and fauna (e.g. low dissolved oxygen, acidic waters).
- The riparian zone of Hourigan Creek was comprised of dense eucalypt forest (~10 m wide) and was relatively continuous for most of its length on one bank but highly fragmented on the other.
- Surrounding lands at both creeks mainly consisted of cleared (or partially cleared) reserves, cleared grazing land and a refuse disposal facility.

- Water quality was not tested at Raglan Creek as it was low tide at the time of the surveys. At Hourigan Creek waters were saline (~35 ppt), slightly acidic (pH ~5.85) with a low dissolved oxygen concentration (1.2–1.9 mg/L) and a maximum turbidity of 70.7 NTU at the time of sampling. These conditions were typical of small mangrove lined estuarine creeks, particularly at low tide when bed sediments may be resuspended and water levels are low.

*Site 14 – Unnamed tributary of Larcom Vale Creek*

- This site is a low order ephemeral drainage, which was dry at the time of sampling. Substrates were comprised of coarse sands (~80%), cobbles and gravel. Bank slumping and channel aggradation was evident.
- Stream gradient was elevated with a greatly undulating bed containing large amounts of woody debris that would provide a variety of micro-habitats during flow events.
- Both banks supported semi-continuous riparian vegetation dominated by *Eucalyptus*, *Melaleuca* and *Callistemon* species
- Surrounding lands were comprised of semi-natural, uncleared vegetation on one side and cleared grazing land on the other.

*Site 15 – Larcom Creek*

- Larcom Creek was surrounded by cleared pasture and supported narrow, semi-continuous to sparse riparian vegetation that was numerically dominated by Weeping Bottle Brush (*Callistemon viminalis*)
- Banks were highly unstable, a consequence of the lack of vegetation and ongoing stock and human usage.
- Despite having a highly degraded riparian zone, the creek had a high degree of micro-habitat diversity, and represented one of the largest in-stream pools within the project area. The pool had a sand/gravel substrate and a high cover of aquatic macrophytes and in-stream algae (~100% cover).
- Floating macrophytes were restricted to the deeper waters, whereas submergent macrophytes covered most of the pool (see Section 8.5.3.3). Large woody debris (snag) cover was also high at this site.
- Waters at Larcom Creek were fresh (< 0.25 ppt) with high concentrations of dissolved oxygen (> 9 mg/L) and a high pH (> 9.1) (Table.2).

*Site 16 – Sandy Creek*

- Sandy Creek is an ephemeral drainage with a sand and mud substrate. No water was present at the time of sampling.

- The channel was aggrading and had highly eroded banks. The surrounding lands consisted of cleared grazing lands. A narrow riparian vegetation fringe, comprised of remnant eucalypt forest, was present on both sides of the creek.

**Table.2 Physio-chemical water quality parameters of waterways within the Bajool to Gladstone section of the project area**

Site	Date	Time	Temp	Conductivity	Salinity	DO	Depth	pH	Turbidity
	D/M/Y	hh:mm	C	µS/cm	ppt	mg/L	m		NTU
Inkerman Creek	25/08/2007	15:45	24.5	-	60	4.8	Surface	7.45	375
Twelve Mile Creek	23/08/2007	11:00	20.97	3799	1.81	6.1	Surface	7.66	14.2
Twelve Mile Creek	23/08/2007	11:00	20.92	3739	1.78	6.8	Surface	7.78	19.7
Twelve Mile Creek	23/08/2007	11:00	20.7	3722	1.77	6.1	1	7.72	27.4
Twelve Mile Creek	23/08/2007	11:00	20.02	3749	1.78	2.4	2	7.44	21.1
Hourigan Creek	23/08/2007	14:30	20.37	-	36.04	1.4	Surface	5.84	70.7
Hourigan Creek	23/08/2007	14:30	20.38	-	35.9	1.2	Surface	5.84	54.8
Hourigan Creek	27/08/2007	14:30	20.04	-	32.49	1.9	Surface	5.9	-
Larcom Creek	27/08/2007	11:30	22.6	645	0.24	12.3	Surface	9.51	4.3
Larcom Creek	27/08/2007	11:30	22.83	541	0.19	9.7	Surface	9.14	5.6
Larcom Creek	27/08/2007	11:30	22.99	539	0.19	10.3	Surface	9.18	5.9

*Note: data has been omitted in places where water depths were too shallow to obtain accurate measurements (denoted by '-').*