8 AQUATIC (FRESHWATER) ECOLOGY

8.1 INTRODUCTION

Chapter 8 provides a summary of the values, potential impacts and mitigation measures associated with existing aquatic ecology values of the Gas Field Component area. Detailed reports are provided in *Appendix 3.2.*

The Project environmental objective for aquatic ecology is to undertake Project activities such that impacts on abundance and distribution of aquatic flora, fauna and ecological communities are minimised.

This objective and those values defined by legislation and planning instruments for aquatic environments have been assessed through desktop studies and field surveys including:

- reviews of relevant published literature for the wider area
- reviews of databases (e.g. Queensland Museum and Department of Environment and Resource Management (DERM) WildNet, National Environmental Significance (NES) matters online; Directory of Important Wetlands (Blackman et. al., 1999); DERM's Biodiversity Planning Assessment (2008a) which identifies ecological features and values of local, regional and state significance as recognised by the DERM and Queensland Museum.

In addition to the on-going above searches, ecologists have consulted with:

- DERM
- Department of Employment, Economic Development & Innovation (formerly Department of Primary Industries and Fisheries)
- landholders.

8.2 DESCRIPTION OF ENVIRONMENTAL VALUES

8.2.1 Aquatic Environment

8.2.1.1 Description

The Condamine and Balonne Rivers drain the region of the Gas Field towards the south-west. The northernmost tenements also cross into the upper reaches of the Dawson catchment which eventually flow into the Fitzroy catchment. These rivers and watercourses flow intermittently after rain and normally consist of a series of isolated waterholes of varying size. The larger waterholes are used frequently for recreational fishing.

There are two major wetlands within the Condamine catchment: Lake Broadwater Conservation Park and Resources Reserve 25 km southwest of Dalby on the eastern boundary of Petroleum Lease (PL) 279 and

The Gums Lagoon 26 km south-west of Tara and approximately 40km south and west of the nearest Project tenements. These are shown in Figure 3.8.1 below.

Lake Broadwater is classified as a palustrine system with lacustrine wetlands on the outskirts and supports four wetland communities:

- open-water communities
- lake-edge communities
- marsh communities
- riparian communities.

The Gums Lagoon is classified as a palustrine system with a relatively undisturbed wooded swamp in a small reserve of similarly undisturbed woodlands and open forest (Queensland National Parks and Wildlife Service 1986). The Gums Lagoon supports 79 identified species of birds some of which are afforded special status under the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). These bilateral agreements provide for the conservation of terrestrial, water and shorebird species that migrate between Australia and the respective countries.

The Gas Field also contains a number of small areas mapped by the Queensland Herbarium mapping as wetlands (*Figure 3.8.2*). They are mapped as not of concern regional ecosystem (RE) 11.3.27b (i.e. Palustrine wetland). These wetlands were not able to be accessed in the field due to landholder constraints but aerial photography interpretation shows that they are all small ephemeral wetlands, in most cases closely associated with, and in close proximity to, significant watercourses. Aerial photograph interpretation indicates that most are subject to grazing and in degraded-to-average condition. They cover a total estimated area of 111 ha.

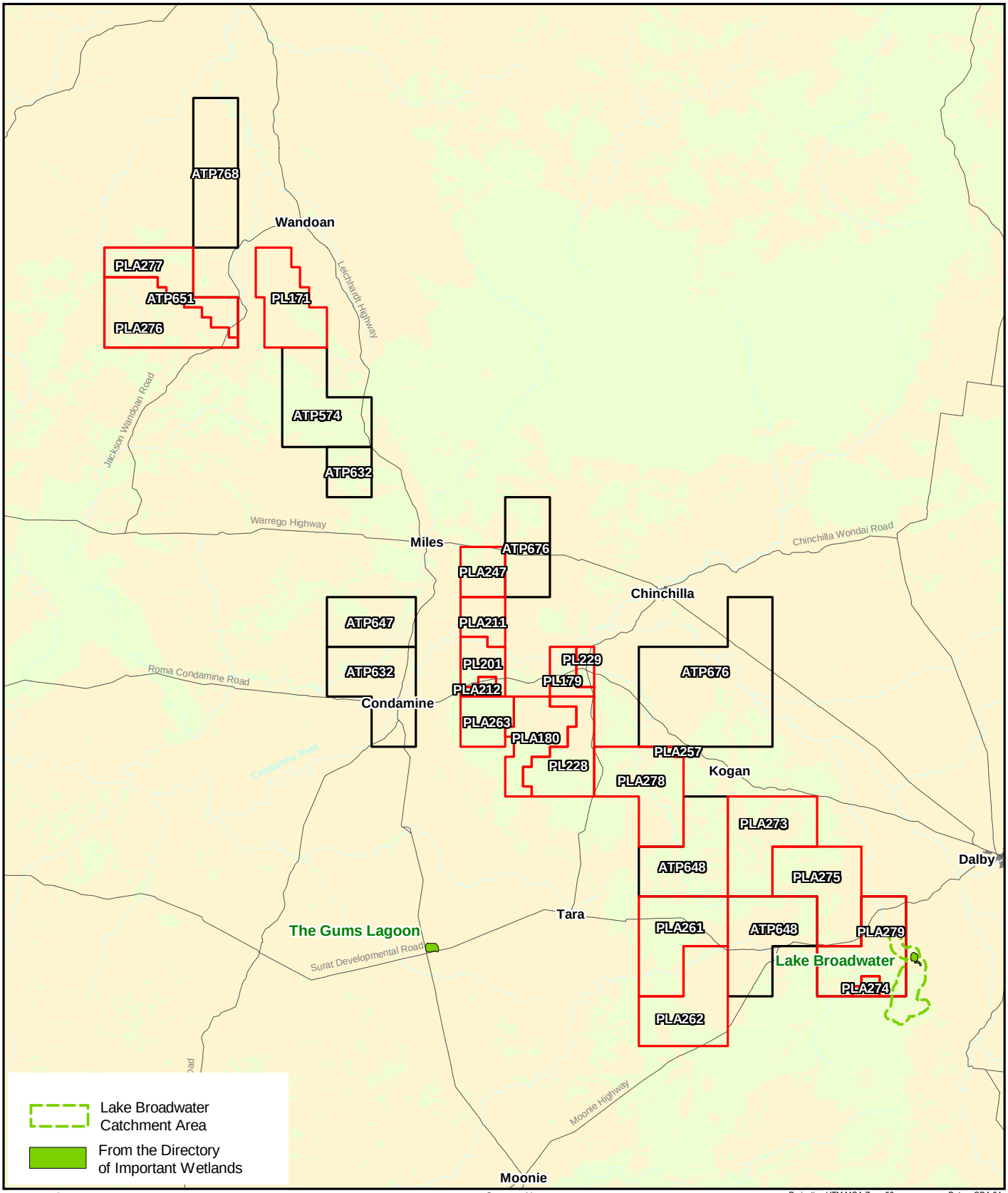
Surface water features within the Gas Field are described in detail within *Appendix 3.3*.

8.2.2 National, State and Regionally Significant Aquatic Taxa

8.2.2.1 Endangered, Vulnerable or Rare (EVR) and Regionally Significant Flora

The Gas Field contains little aquatic flora, consisting primarily of a small number of common aquatic plants on the margins of waterways, farm dams, watercourse depressions, ephemeral wetlands and flood-out areas.

Although there are no records of EVR aquatic flora species within the Gas Field, two (*Eleocharis blakeana* and *Fimbristylis vagans*) are known to occur in the neighbouring Lake Broadwater, immediately east of the Gas Field. Under the right seasonal conditions, there is potential for these two EVR species, as well as the Queensland Lace Plant (*Aponogeton queenslandicus* listed as Rare under the *Nature Conservation Act 1992* (Qld) *(NC Act)*), to occur within freshwater pools in watercourses, farm dams and weirs within the Gas Field. *Table 3.8.1* below describes the status of aquatic flora in the Gas Field.



Legend:

- Gas Fields - Petroleum Lease/Petroleum Lease Application
- Gas Fields - Authority to Prospect

Source Note:

1:250,000 Topographic Vector copyright Geoscience Australia
Important Wetlands copyright Department of Primary Industries
Coastal Wetland Vegetation

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

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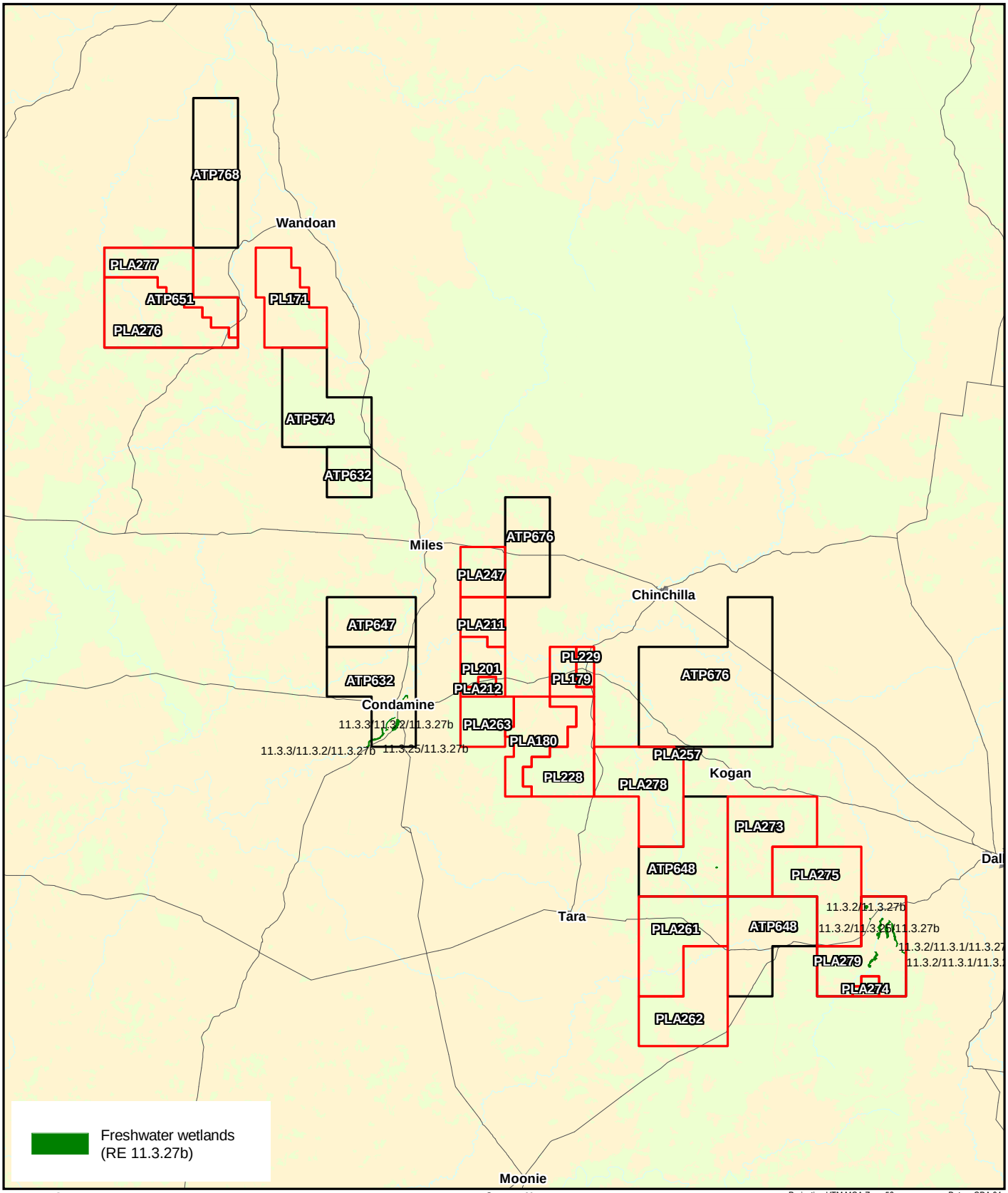
QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Important Wetlands Areas**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	Volume: 3 Figure: 3.8.1	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: CD	File No: QC02-T-MA-00084	
	Date: 06.07.09	Revision: A	



Legend:

Gas Fields - Petroleum Lease/Petroleum Lease Application

Gas Fields - Authority to Prospect

Source Note:

1:250,000 Topographic data copyright Commonwealth of Australia
Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Freshwater Wetlands (RE 11.3.27b)**
	Client: QGC - A BG Group business		
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	Approved: CDiP	File No: QC02-T-MA-00089	
	Date: 10.06.09	Revision: A	

Table 3.8.1 Potential EVR and Regionally Significant Flora Occurrence

Common Name	Scientific Name	Status	Source	Comments
Queensland Lace Plant	*Aponogeton queenslandicus*	R1	2,3	A seasonally emergent aquatic plant found throughout much of coastal Queensland. Herbarium records one sighting just outside the most northern Gas Field tenement. Field surveys did not find this species in any areas within the Gas Field, although it is possible that they do occur in preferred habitat types.
Blake's Spikerush	*Eleocharis blakeana*	R1	3	Known in wet, poorly drained soils; records along Auburn Rd Chinchilla and Lake Broadwater. Not recorded in the Gas Field.
Fimbristylis vagans	*Fimbristylis vagans*	R1	2,3	Wet creek/drainage lines. Wetland plant recorded in the nearby Lake Broadwater Area

1 NCA Listed Rare; Source 2 = WildNet 3 = Herbrecs.

8.2.2.2 EVR and Regionally Significant Fauna

Queensland Museum and WildNet records list 18 species of fish from the catchment in the Gas Field, two of which are introduced. One species, the Murray Cod, is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (*EPBC Act)*. Additionally, the Southern Purple-spotted Gudgeon is listed as Priority Taxa under Biodiversity Assessment and Mapping Methodology (BAMM) Criteria H (EPA 2008b).

The description of each fish species in presented in *Table 3.8.2*. No molluscs, crustacea or other invertebrate group appear in any of the desktop studies or databases used in researching this impact assessment.

Table 3.8.2 Fish Recorded in the Catchment of the Gas Field

Common Name	Scientific Name	Status	Preferred Habitat
Bony Bream[1]	*Nematalosa erebi*	No status	Recorded sightings from the Condamine River
Australian Smelt[1]	*Retropinna semoni*	No status	Recorded in the Condamine river in an area west of Chinchilla
Goldfish*[1]	*Carassius auratus*	No status	Recorded from the Condamine River and Wilkie Creek
Yellow-finned Eel-tailed Catfish [1]	*Neosilurus hyrtlii*	No status	Recorded in the Condamine River and Lake Broadwater
Rendah's Catfish[1]	*Porochilus rendahli*	No status	Known sightings within small tributaries of the Condamine River, such as Branch Creek.
Common Eel-tailed Catfish [1,2]	*Tandanus tandanus*	No status	Recorded sightings in the Condamine River, Lake Broadwater and Dogwood Creek.

Common Name	Scientific Name	Status	Preferred Habitat
Mosquito Fish*[1]	*Gambusia holbrooki*	No status	Recorded in the Condamine River in areas in close proximity to Chinchilla.
Murray River Rainbowfish[1]	*Melanotaenia fluviatilis*	No status	Recorded sightings in Brigalow Creek and the Chinchilla Weir
Fly-specked Hardyhead[1]	*Craterocephalus stercusmuscarum*	No status	One recorded sighting in Brigalow Creek
Agassiz's Olive Glassfish [1]	*Ambassis agassizii*	No status	One recorded sighting at Chinchilla Weir
Murray Cod[1,2]	*Maccullochella peelii peelii*	V[2]	Recorded in the Condamine River in areas in close proximity to Chinchilla
Golden Perch[1]	*Macquaria ambigua*	No status	Recorded in Condamine River
Spangled Perch[1]	*Leiopotherapon unicolor*	No status	Recorded in Condamine and Balonne Rivers and Wilkie Creek
Western Carp Gudgeon[1]	Hypseleotris klunzingeri	No status	Sightings in Condamine River and Brigalow Creek
Gudgeon Species[1]	Hypseleotris sp	No status	Recorded sightings in Condamine River and Lake Broadwater
Silver Perch[2]	*Bidyanus biyanus*	No status	Condamine – not upstream of Dalby. Localised, rare.
Darling River Hardyhead[2]	*Cratercephalus amnicularis*	No status	Lower parts of the Balonne and McIntyre Rivers. Possibly occurs in the Gas Field.
Southern Purple-spotted Gudgeon[2]	*Morgurnda adspersa*	No status	Widespread in the upper parts of creek and river systems.

Status V[2] = EPBC Act Vulnerable; * Introduced species; [1] Qld Museum Records; [2] BAMM Report EPA 2002.

8.2.3 Declared and Environmental Aquatic Weeds and Introduced Fish

No aquatic weeds are known to occur in the Gas Field, although the propensity for such weeds to spread via waterbird vectors would suggest that some species may occur, at least in the more permanent waterholes and large dams.

The introduced Goldfish and Mosquito fish have been recorded in the area. It is highly likely that numbers and distribution fluctuate according to stream flows and that these species are present in many parts of the Gas Field. No surveys were conducted to examine the distribution or abundance of these or other fish species in the Gas Field.

8.3 POTENTIAL IMPACTS

8.3.1 Potential Impacts to Aquatic Environments and Taxa

Most aquatic species present in the Gas Field are widespread and abundant, so are unlikely to be significantly impacted. Nevertheless, the proposed development has the potential to impact on aquatic ecosystems and associated species through:

- direct clearance and disturbance by machinery
- indirect impacts, being altered water, sediment and nutrient flows if watercourse disturbance is not effectively managed
- initial drilling activities resulting in the production of Associated Water which is saline (generally 2,000-5,000 mg/L refer *Volume 3, Chapter 11*). Vegetation in the vicinity of the wells may be impacted should Associated Water leach from storage dams or flow into nearby vegetation
- accidental release of Associated Water with higher levels of salinity from evaporation ponds or other associated water infrastructure.

The only threatened fish species that is known to occur within the watercourses that transect the Gas Field is the Murray Cod (*Maccullochella peelii peelii*). This species could potentially be impacted through altered flow regime and increased sedimentation and/or nutrification of watercourses. However, with the implementation of mitigation measures set out in Section 8.4 it is considered unlikely that the proposed developments will have a significant impact on this species.

No major wetlands occur within the Gas Field although two are located immediately outside the Gas Field. These are Lake Broadwater Conservation Park and Resources Reserve and The Gums Lagoon.

Lake Broadwater is located downstream of Broadwater gully which is situated within the Gas Field, PLA279 (refer Figure 3.8.1). Without appropriate mitigation measures, there could be potential for some impacts from flows contaminated with nutrient and sediment or an accidental release of associated water.

The Gums Lagoon is not downstream of the Gas Field. Therefore this wetland is not expected to be directly or indirectly impacted by the proposed activities.

The only internationally recognised wetland downstream of the Gas Field (via the Condamine River) is the Ramsar-listed Narran Lake Nature Reserve. It is approximately 450 km south-west of the Gas Field and as a result there is a low potential for the proposed activities to indirectly impact this wetland.

Areas in the Gas Field mapped as ephemeral wetlands, may, due to their sensitivity, potentially be impacted if CSG activities were conducted in close proximity. These potential impacts include sedimentation, eutrophication and accidental release of Associated Water.

Provided that the mitigation measures as outlined below are employed, no significant direct or indirect impacts to aquatic ecosystems or any aquatic plant species are considered likely.

An assessment of the significance of the impacts on EPBC-listed threatened ecological communities is not applicable in this instance, since no listed aquatic communities are recorded within the Gas Field.

8.4 MITIGATION AND REHABILITATION

8.4.1 Mitigation Guidelines

As with terrestrial fauna, aquatic systems have been included in an overall assessment of the Gas Field's biodiversity values. DERM's relatively new AquaBAMM assessment process has not been applied to the Murray-Darling catchment which extends across almost all of the Gas Field. In the absence of this type of assessment, a highly conservative approach has been adopted which:

- identifies all ephemeral wetland areas (RE 11.3.27) in the Gas Field to be excluded from development
- identifies all watercourses within the Gas Field to be subjected to current EA conditions which stipulate that development is to be excluded from 50 m of Stream Orders 1 and 2, 100 m from a Stream Orders 3 and 4 and 200 m from Stream Orders 5-8
- locates surface infrastructure away from major river and creek systems whenever possible
- in cases where traversing a watercourse is unavoidable, sets the clearance path design at approximately 90 degrees to the watercourse to limit the extent of clearing, and clearing widths will be reduced to the minimum safe width
- includes measures to avoid placing water storage facilities in the Lake Broadwater catchment area (Broadwater Gully) which occurs in the south-eastern corner of PLA 279 (refer Figure 3.8.1). This may reduce the potential for nutrient and sediment flows or the accidental release of Associated Water entering Lake Broadwater Conservation Park

These protection measures will be implemented in addition to those contained in the existing Environmental Management Plan (e.g. weed washdowns, water disposal, environmental monitoring, auditing and reporting).

Under the *Fisheries Act 1994* (Qld) and the DPIF Operational Policy (FHMOP 008[1]) on Waterway Barrier Works, the construction of infrastructure that would impede waterways and therefore impact on fish passage, would require approval.

QGC will comply with applicable requirements of the *Fisheries Act* and associated operational policies and guidelines. The construction and operation of Gas Field infrastructure is not anticipated to restrict the flow of water in waterways or significantly restrict fish movement.

1 Peterken, C. (2001) Waterway Barrier Works Approvals and Fishway Assessments: Departmental Procedures, Queensland Department of Primary Industries Fish Habitat Management Operational Policy FHMOP 008

8.4.2 Rehabilitation

Rehabilitation will be negotiated with landholders where applicable. Unless roads and pads are to be retained for another use, creek-line environments will be re-contoured and rehabilitated allowing natural re-vegetation and flow regimes to be maintained.

Local provenance plant species will be sown to stabilise banks and prevent erosion where required.

Monitoring and control of weeds will be conducted on an ongoing basis during the life of the Gas Field. A Weed Management Plan that addresses the construction, rehabilitation and operation phases of the Project will be prepared prior to construction and will form part of the Draft EMP for the construction, operation and decommissioning of the Gas Field. The Draft EMP includes hygiene protocols to minimise the likelihood of introducing and spreading environmental, agricultural and declared weeds.

Vegetative waste as a result of clearing will be mulched or distributed across adjacent areas where it may provide refuge for terrestrial species. Large scale burning of vegetative wastes is also to be avoided.

Rehabilitation will be monitored on a monthly basis for six months after works are completed and then bi-annually for two years.

8.4.3 Environmental Offsets

Environmental offsets will be implemented as described in *Volume 3, Chapter 7*.

8.5 CONCLUSION

The proposed Gas Field Component activities of the Queensland Curtis LNG Project are unlikely to impact on aquatic biological features and values in or downstream of the Gas Field, provided that the recommended mitigation and rehabilitation measures are adopted and successfully implemented. A summary of the impacts outlined in this chapter is provided in *Table 3.8.3* below.

Table 3.8.3 Summary of Impacts for Aquatic Ecology

Impact assessment criteria	Assessment outcome
Impact assessment	Negative
Impact type	Direct
Impact duration	Short term
Impact extent	Local
Impact likelihood	Unlikely

Overall assessment of impact significance: negligible.