GLNG Facility, Curtis Island

Water Mouse Survey

Report prepared
for
URS Australia

Biodiversity Assessment
AND MANAGEMENT PTY LTD

FAUNA AND HABITAT SPECIALISTS

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Project Author/s: Brett Taylor

Project Summary: A survey for the presence of Water Mouse *Xeromys myoides* was carried out on two areas to be potentially impacted by the GLNG facility located on Curtis Island.

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Signed on behalf of
Biodiversity Assessment and Management Pty Ltd

Date: 23/05/2012

Director

WATER MOUSE SURVEY
GLNG FACILITY, CURTIS ISLAND

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List of Abbreviations

BAAM	Biodiversity Assessment and Management Pty Ltd
DERM	Queensland Department of Environment and Resource Management
DEWHA SEWPaC)	Commonwealth Department of Environment, Water, Heritage and the Arts (now
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
NC Act	Queensland *Nature Conservation Act 1992*
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (formerly DEWHA)

1.0 INTRODUCTION

1.1. BACKGROUND AND PURPOSE

Biodiversity Assessment and Management (BAAM) has prepared this report for URS Australia for the purpose of providing an independent assessment on the presence of Water Mouse *Xeromys myoides* on lands designated for expanded construction activities associated with the LNG processing facility at China Bay on Curtis Island (the 'Study Area'), Gladstone, proposed by Santos, PETRONAS, Total and KOGAS as part of the GLNG Project.

The specific aims of this report are to provide the results of a detailed survey for Water Mouse and suitable habitat for Water Mouse within the designated survey sites.

The results documented in this report are based on previous site investigations by BAAM staff (BAAM 2009; 2011) and site investigations undertaken by Brett Taylor and James Wilson on 2nd to 5th April 2012 inclusive. Brett Taylor (Senior Ecologist, with experience in Water Mouse surveys) led the field survey and has written the report.

1.2. SITE DESCRIPTION

China Bay is located on the south-west corner of Curtis Island, approximately 7 km north of the town of Gladstone, south-east Queensland (**Figure 1.1**). The Study Area comprises two survey sites: one located at the northern extent of China Bay (Trap Line 1) and the second located in a small embayment 700 m south of China Bay (Trap Line 2) (**Figures 1.2** and **1.3**). A small area to the north of the southern embayment was also assessed for its suitability as habitat for Water Mouse. The Study Area comprises tidal mangrove flats including an area of approximately 22 ha of mangroves contained within China Bay itself with a further 5 ha of mangroves to the south.

The mangrove tree species throughout the two study sites are dominated by Red Mangrove *Rhizophora stylosa*. Other species such as Grey Mangrove *Avicennia marina* and Yellow Mangrove *Ceriops* species are present in low numbers through the body of the inundation zone and in greater numbers along the landward edge of the mangroves. The shoreline of the point adjacent to the northern edge of Trap Line 1 is comparatively steep and rocky with sparsely distributed and low-growing mangroves. The northern extent of Trap line 2 is also located on a rocky substrate. The remaining area of Trap Line 2 is largely connected to adjacent bushland. Construction activities located in areas adjacent to the trap sites was ongoing at the time of the surveys.

1.3. PROPOSED WORKS

It is understood the proposed activities will extend the previous construction footprint requiring minor clearing of the littoral zone limited to areas in the north of China Bay and two small areas including the northern extent of Trap Line 2 (**Figures 1.2** and **1.3**).

2.0 LITERATURE REVIEW

2.1. SPECIES PROFILE - WATER MOUSE *XEROMYS MYOIDES*

Status: NC Act Vulnerable; EPBC Act Vulnerable.

Water Mouse is also considered of 'High' priority under the Back on Track species prioritisation framework (DERM 2012).

Species Description: The Water Mouse (or False Water-rat) is a small rodent with short rounded ears and small eyes. It reaches a maximum body length of 126 mm and a weight of 64 g. The fur is short and dense and is dark grey above and white below. In Queensland adults usually have white spots on the back. The tail is slender with few hairs and is smooth. The species has a distinctive musky odour (Gynther and Janetzki 2008).

Ecology and Habitat: The Water Mouse is a nocturnal, terrestrial carnivore and is one of Australia's most poorly known rodents. The species occurs in mangroves, saltmarsh, sedged lakes near foredunes and coastal freshwater swamps. They require relatively large areas of intertidal flats over which to forage, together with suitable adjacent areas for nest sites. Home ranges of around 0.7 ha have been recorded and individuals are known to cover distances of up to 2.9 km within these areas (Van Dyck 1996; Gynther and Janetzki 2008).

Legend

Survey Sites

0 0.75 1.5 2.25 3

Kilometers
Datum: GDA94
Projection: MGA94 Zone 56

Figure 1.1
Locality of the Survey Sites

Water Mouse Survey – GLNG Facility, Curtis Island

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Legend

- Moderate Quality Water Mouse Habitat
- Low Quality Water Mouse Habitat
- Transect Start/End Point
- Transect
- Photo location
- Development Footprint Outline

0 25 50 75 100
Meters
Datum: GDA94
Projection: MGA94 Zone 56

Figure 1.2
GLNG Infrastructure Footprint Overlayed on Northern Water Mouse Habitat Survey Area, with Trapping Line Indicated

Water Mouse Survey – GLNG Facility, Curtis Island

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Legend

- Moderate Quality Water Mouse Habitat
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- Photo location
- Development Footprint Outline

0 20 40 60 80
Meters
Datum: GDA94
Projection: MGA94 Zone 56

Figure 1.3
GLNG Infrastructure Footprint Overlayed on Northern Water Mouse Habitat Survey Area, with Trapping Line Indicated

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Activity rhythms are constrained by the tidal cycle, with the species foraging only when intertidal habitats are exposed between high tides at night. Foraging individuals follow the receding water out into the mangrove zone where food resources are most productive (Gynther and Janetzki 2008).

Food for this species primarily consists of marine crustaceans, bivalves and other invertebrates. Small amounts of plant material have been found in their stomachs, though this is thought to have originated from their ingested prey. The species leaves distinctive 'middens' of prey remains usually in hollow logs or at the base of trees (Van Dyck 1996; Gynther and Janetzki 2008).

The species builds termitarium-like mounds up to 60 cm high and digs tunnels. The nests, regardless of type or structure, primarily serve as diurnal refuges and reproductive sites. Nests often occupy naturally elevated ground and utilise the bases of fallen trees or logs for support of the nest structure (Van Dyck 1996; Gynther and Janetzki 2008).

In the central Queensland coast region the species is only known to occur in the high inter-tidal zone in tall, closed fringing mangrove forest comprising Yellow Mangrove *Ceriops tagal* and *Bruguiera* species, and closed Grey Mangrove *Avicennia marina* forest including adjacent saline grasslands. Within this habitat it constructs nests within the buttress roots of Yellow Mangrove *Ceriops tagal* and *Bruguiera* species (Ball 2004; DEWHA 2009a).

Distribution and Breeding: The Water Mouse is patchily distributed in the Northern Territory, and from the Gold Coast to Proserpine in Queensland (Menkhorst and Knight 2004). Ball (2004) notes within its range the species occurs patchily, even where habitat appears suitable for nesting and foraging. It is known to disappear from areas where it was previously recorded and conversely is recorded where the species had never been observed in the past.

Knowledge of the species' breeding biology is limited, but births apparently occur in any season (Gynther and Janetzki 2008).

Generally, there is only one sexually active male present in a nest and nests may be used by successive generations over a number of years. Once constructed, nests are continuously added to, with the larger mounds or nests having potential to provide significant historical information about populations and habitats over time (Van Dyck 1996).

Threats: Threats and threatening processes to Water Mouse as identified in the EPBC Background Paper (DEWHA 2009a) include:

- Habitat removal and modifications;
- Alteration of natural hydrology, including increased freshwater inflows, sedimentation from storm water run-off, physical changes that modify tidal inundation and modified water levels and salinity in tidal waterways;
- Disturbance of acid-sulfate soils;
- Weed invasion;
- Predation, particularly from feral predators such as domestic cats and dogs, foxes and feral pigs;
- Herbicides, pesticides and oil pollution; and
- Other threats, including vehicle wheel ruts, prolonged or intensive wave action from recreational vessels, fire and cattle grazing.

2.2. Occurrence in the Study Area

Water Mouse had not been recorded in the Gladstone region previous to 2011 (BAAM 2011b). This was likely to have been an artefact of a general lack of surveys, or low survey intensity for the species in the region. Habitat mapping indicated the species was considered likely to occur in mangrove habitats throughout the Gladstone region (DEWHA 2009a; **Appendix 1**).

In March 2011 the first record of Water Mouse from the Gladstone region was trapped on Curtis Island approximately 4 km north of China Bay (BAAM 2011b). The species has subsequently been trapped on the adjacent mainland in The Narrows north of Gladstone. The habitat in these locations (as witnessed by the author) is broadly similar to the description given for the species further north (see Ball 2004), however there would appear to be less dependence on a tall, closed fringing mangrove area being present. On the mainland the species was recorded utilising tunnels within a high estuarine bank as a burrow/nest site and has also been recorded utilising mangrove tree hollows.

Habitat assessment of the Study Area's suitability for Water Mouse was carried out by BAAM staff in December 2008. A trapping survey with a more comprehensive habitat assessment was carried out in China Bay in

December 2010. A total of 115 traps were employed over three nights along the southern half of China Bay (**Figures 1.2** and **1.3**). Although several rodents were trapped no Water Mouse were recorded during the survey.

Mangrove habitat within China Bay was considered to have low to moderate value for Water Mouse on the basis of low to moderate nesting site availability and past disturbance to potential habitats from an access track, refuse dumping and feral animal activity (BAAM 2009; 2011a). The mangrove habitat located 700 m south of China Bay was considered as unsuitable for the species because the coarse substrate in the intertidal zone is less suitable for Water Mouse nesting and foraging due to the low occurrence of crustacean food sources (BAAM 2009; 2011a).

3.0 SURVEY METHODOLOGY

The Water Mouse field investigation was carried out over a period of four days and three nights from 2nd to 5th April 2012 inclusive. Water Mouse is a resident species within its range and births apparently occur in any season (Gynther and Janetzki 2008). Therefore no seasonality of occurrence is expected, meaning that April is as appropriate a time to survey for this species as any other month. Weather conditions during the survey were warm and fine with temperatures ranging from 20°C to 30°C. The tidal regime during the survey period allowed for setting the traps in the evening and collection before dawn allowing for a 6 - 7 hr trapping period each night.

The best practice methodology for Water Mouse field survey involves a combination of habitat assessment, daytime searching and Elliott trapping (DEWHA 2009b). All three of these primary survey techniques were undertaken for this study, as discussed in the following sections. The methodologies are discussed in the following sections.

It is important to note that the dominant species of mangrove throughout the Study Area (Red Mangrove *Rhizophora stylosa*) features distinctive prop roots and the low canopy height (mostly below 4 m) and high density of the vegetation onsite made these areas virtually impenetrable beyond the outer margins, therefore representing a significant constraint in terms of health and safety and animal ethics obligations. Consequently, the undertaking of all terrestrial survey techniques was generally restricted to between the landward edge of the mangroves and the upper edge of the intertidal zone.

3.1. HABITAT ASSESSMENT AND DAYTIME SEARCHES

Habitat assessment was initially carried out over the entire area of each survey site along the landward edge of the mangroves, including those locations eventually established as trapping lines (**Figures 1.2** and **1.3**). Throughout the habitat assessment survey, all mangrove flora species encountered were identified and prey abundance was observed. The habitat assessment survey was used to assess the most suitable locations/habitat for subsequent trapping.

Daytime searches of the study sites for Water Mouse activity were carried out briefly in conjunction with the habitat assessments. Searches focussed on detecting feeding signs (prey middens) and nest mounds. No signs of Water Mouse activity were recorded.

3.2. ELLIOTT TRAPPING

Elliott A type traps were utilised for the trapping component of the survey. Due to the access constraints discussed previously, traps were arranged along the landward edge of the mangroves starting from the northernmost point of suitable habitat within both trap sites. Traps extended as far as considered practical while being able to check for trapped animals before inundation by the high tide.

In both survey areas, traps were arranged along a continual transect running along the mangrove edge with traps arranged approximately 5-10 m apart. Traps were generally located no more than 10 m from the outer edge of the accessible mangrove line.

Although traps were not placed far within the mangroves, Water Mouse will follow the receding water down from their refuge sites in the higher intertidal zone and are expected to encounter trap-lines placed in the mid-intertidal zone and into the edges of the mangroves.

Traps were positioned on the outgoing tide in the early evening using fresh pilchards as bait. Traps were checked and removed several hours later before being inundated by the incoming tide. Trapping was carried out over three consecutive nights with fresh bait used each night.

The field assessment was conducted in accordance with BAAM's Queensland Parks and Wildlife Service Scientific Purposes Permit No. WISP07368010 and Queensland Primary Industries and Fisheries Animal Ethics Committee Certification No. CA 2012/01/578.

4.0 SURVEY RESULTS

In total, 100 traps were used over the survey period (50 traps along each Trap Line) over three nights giving a total of 300 trap nights. No animals were trapped during the survey period, although a single rodent (*Rattus* species) was observed foraging at Trap Line 2 on the third night. The rodent observed was of a size (large) and colour (brown) that distinguished it from Water Mouse.

No obvious signs of Water Mouse presence (nest mounds or prey middens) were observed during the habitat assessment surveys. All of the mounds observed within the inter-tidal zone were low in height with small, steep entrances that are inconsistent with that described for Water Mouse.

The mangrove habitat within the northern survey area is relatively homogenous throughout and is dominated by Red Mangrove *Rhizophora stylosa* except along the landward edges where Grey Mangrove *Avicennia marina* and low-growing Yellow Mangrove *Ceriops* sp. also occur. The canopy height of the mangroves ranges between 2-4 m along the landward edge.

The substrate beyond the western extent of Trap Line 1 is rocky with scattered low-growing mangroves (**Photo 1** indicated as Hab1 on **Figure 1.2**). As shown on **Figure 1.2** this is unsuitable habitat for Water Mouse (open canopy with a very low foraging potential) the trapping transect commenced further to the east where more suitable habitat was located.

Photo 1. Mangrove habitat on rocky substrate from Hab1, Curtis Island.

The mangrove habitat within Trap Line 2 comprises the same mangrove tree species to that of Trap Line 1, although Grey and Yellow Mangrove were more abundant along the edge. The canopy height was generally similar to that at Trap Line 1. The substrate at the northern and western extent of the site was situated on coarse rocky substrate and is of low suitability for Water Mouse (**Figure 1.3**). As a result the trapping transect commenced further to the east.

Despite this, much of the substrate along this transect for the initial 130 m comprised coarse-grained sand/gravel which provides low foraging potential for Water Mouse (i.e. very low numbers of crabs were observed in this area). This part of Trap Line 2 was subject to habitat assessment in a previous survey (BAAM 2009) and it was considered that Water Mouse would be unlikely to occur in the area.

A third small area located approximately 120 m west of the starting point of Trap line 2 which was also part of this survey was subject to habitat assessment only (**Figure 1.3**). This area comprised low-growing (approximately 1 m canopy height) scattered mangrove species on a rocky substrate (**Photo 2** indicated as Hab2 on **Figure 1.3**). This area was deemed to have very little suitability as foraging or nesting habitat for Water Mouse and was therefore not considered in the trapping program.

Photo 2. Low mangrove habitat on rocky substrate from Hab2, Curtis Island.

5.0 POTENTIAL OCCURRENCE WITHIN THE STUDY AREA

In the past (within the region) Water Mouse was only known to nest in the high inter-tidal zone in tall, closed fringing mangrove forest comprising Yellow Mangrove *Ceriops* species and *Bruguiera* species, and closed Grey Mangrove *Avicennia marina* forest including adjacent saline grasslands (Ball 2004; DEWHA 2009a). The available fringing mangrove habitat within the study sites is patchy, has an open canopy and is largely less than 3 m in height.

Under this description the available nesting habitat in the study sites is marginal at best, however, recent records of the species in the Gladstone area, including Curtis Island, were found in mangrove habitat similar to that found on the study sites. Although the occurrence of Water Mouse cannot be discounted completely this is the second trapping event in the GLNG Project area which has not recorded the species and therefore it is considered unlikely the species is present in mangrove habitat within the GLNG facility site.

As it is understood the proposed footprint for construction activities (**Figures 1.2** and **1.3**) will largely impact mangrove habitat which is considered to be of low foraging/nesting potential for Water Mouse (i.e. scattered mangroves on rocky substrate). Nonetheless, the remaining extant mangrove communities on the study sites provide potential foraging habitat and may provide future habitat or linkages between higher value habitats in the local landscape.

6.0 IMPACT ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

The proposed extension to the GLNG infrastructure disturbance footprint does not directly impact upon any moderate or high potential Water Mouse foraging or nesting habitat identified in this study. It is understood that a Water Mouse Management Plan is already in place for the GLNG Project area. No further recommendations are considered necessary as a result of the findings of this study.

7.0 REFERENCES

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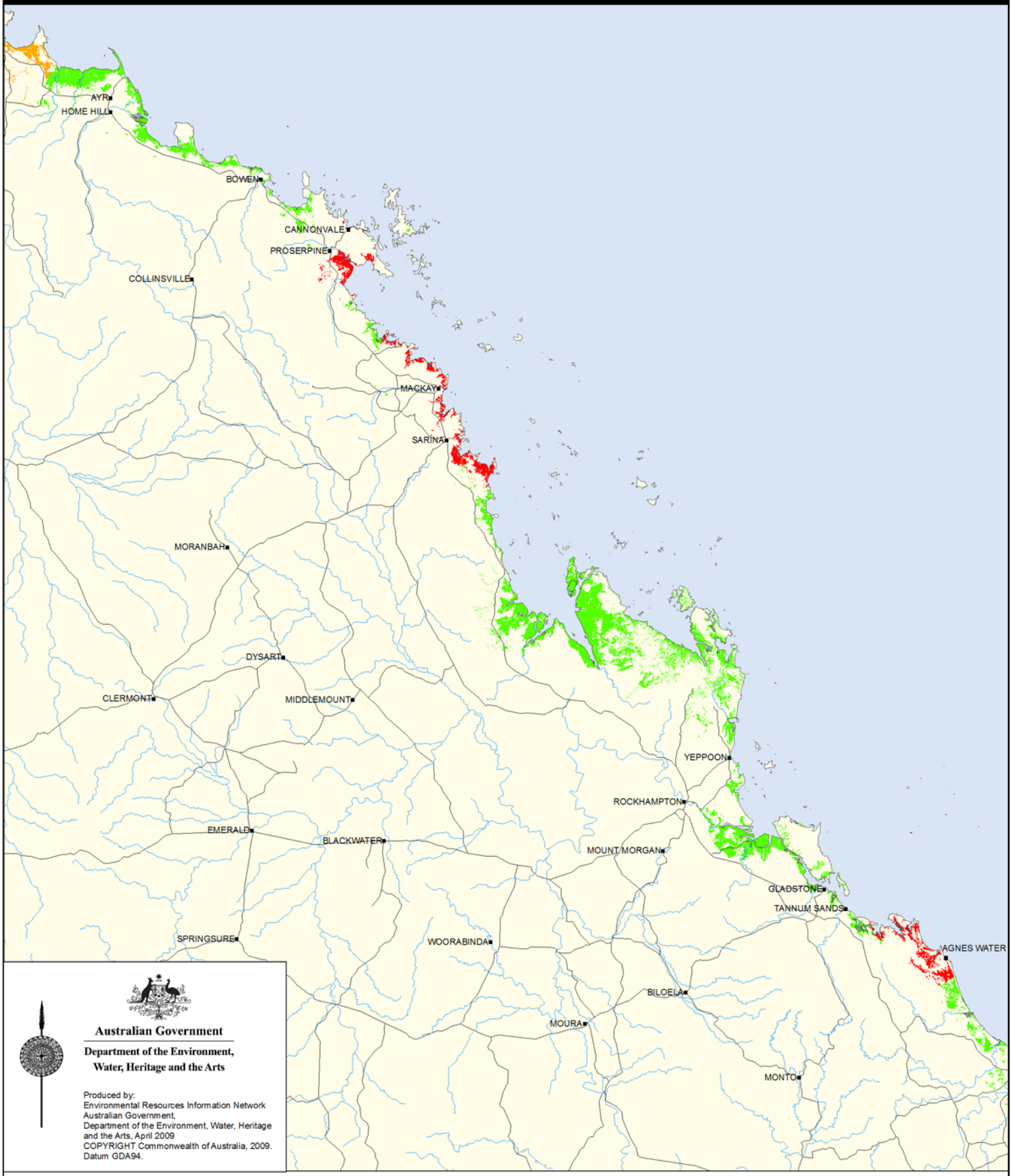
APPENDIX 1
DEWHA HABITAT MAPPING FOR WATER MOUSE ALONG THE CENTRAL QUEENSLAND COAST

water mouse *(Xeromys myoides)* Central South Queensland Map 2



Australian Government
Department of the Environment, Water, Heritage and the Arts

Produced by:
Environmental Resources Information Network
Australian Government,
Department of the Environment, Water, Heritage and the Arts, April 2009

Datum GDA94.

Legend

Rivers
Roads

Habitat

Known
Likely
May

Source:
Habitat is based on distance thresholds from known reliable species locations extracted from the Species Profile and Threats Database. Habitat has been confined to contiguous suitable coastal vegetation. These broad vegetation groups included Mangroves, Heathlands, Shrublands and Forblands, Melaleuca Forests, Mudflats, Grasslands, Herblands, Sedgelands and Rushlands.

Vegetation:
NVIS data, from NVIS Stage 1, Detailed Version 3.1., 2008.
Estuarine Macrophytes of the Northern and Southern CCA regions (NSW DPI)
Shoreline Habitats (CALM WA)

Species Location Records:
Queensland Department of Environment and Resource Management
The Queensland Museum
The Northern Territory Natural Resources, Environment, The Arts & Sport

0 50 100 150 200 Km