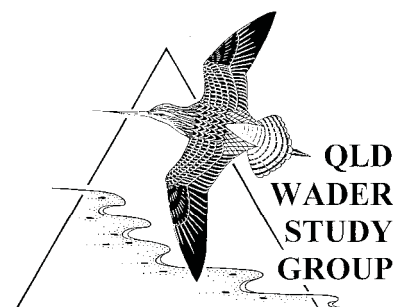


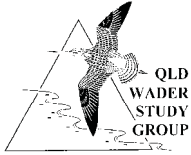


Moreton Bay Regional Council Shorebird Habitat Mapping Project

David Milton and Jill Dening
Report 640/1-20-5/P
30 June 2009

For Planning and Environment, Moreton Bay Regional Council
Ms E Porter & Mr M Messer





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1. SUMMARY

Moreton Bay provides critical non-breeding habitat for up to 42 species of migratory and resident shorebird. It was designated a RAMSAR site of international importance in 1996 as it meets two of the criteria. It holds > 20,000 migratory shorebirds and supporting >1% of the world population of eight species. Migratory shorebirds are also EPBC-listed species and the subject of several international agreements. These birds feed in intertidal areas at low tide and roost in adjacent supratidal areas at high tide. Thus, undisturbed high tide roosting habitats are important to maintain their populations and enable them to undertake the annual 20,000 km round trip to their arctic breeding grounds. There are large populations of shorebirds within Moreton Bay Regional Council (MBRC) boundaries. The MBRC region supports over 50% of the shorebirds in Moreton Bay due to large areas of intertidal feeding habitat and suitable adjacent roosting habitat. The aim of this project was to map the shorebird roosts within MBRC jurisdiction, summarise the numbers of shorebirds using each roost, categorise the important habitats of each roost and document known threats. The geographical locations and extents of each shorebird high tide roost have been mapped and incorporated into the MBRC GIS system. A total of 28 high tide roosts have been identified, mapped and their use by shorebirds and waterbirds summarised. A summary table provides a list of the species found at each roost and the mean and maximum count. These indices of relative abundance can be used to assess the relative importance of each roost for shorebirds. The northern parts of the MBRC in Pumicestone Passage support the greatest number of shorebirds. Up to 55 species of shorebird and waterbird have been documented from some large roosts in the southern Pumicestone Passage and North Pine River. It is most critical for the MBRC to protect and maintain the viability of these roosts as they support a large number of shorebirds. A number of threats to the viability of roosts were identified, including natural and introduced predators and disturbance by people and their pets. The most significant threat to shorebird roost use in MBRC is from disturbance by people and their dogs. Buckley's Hole Sandbar on the southern end of Bribie Is is the most consistently disturbed roost within MBRC and Moreton Bay. All the large roosts in the southern Pumicestone Passage also receive regular disturbance. The low level of coastal development within the northern MBRC where the shorebird numbers are greatest means that the MBRC have an important role in the protection of the shorebird populations in the region. To help facilitate this, simple planning guidelines have been developed to be used in conjunction with this report to advise MBRC planners in their assessment of development applications.

2. INTRODUCTION

2.1 Background

Shorebirds, also known around the world as 'waders'; comprise 10% of Australia's bird species. Most shorebirds that visit Moreton Bay during summer (September – April) are migratory. They breed in Siberia and Alaska and travel the East Asian-Australasian Flyway twice a year on migration. About 2 million shorebirds migrate to Australia every year, travelling up to 25,000 km. From September to April, a large number of shorebird species (up to 40,000 birds) are found in Moreton Bay. Some shorebirds reside in one location for their entire lives, and are

known as 'resident' shorebirds (see Appendix A for definitions). Many shorebirds roost (or rest) above the high tide mark and feed at low tide in mud flats. The species of shorebirds that use Moreton Bay (including Pumicestone Passage) are listed in Appendix B.

Moreton Bay Marine Park, including Pumicestone Passage, was declared a Ramsar wetland of international significance partly because of the area's significance as an East Asian-Australasian Flyway shorebird feeding and roosting habitat. Although there are 112 identified shorebird roost sites in Moreton Bay, only 15 of these are available to shorebirds during the particularly high king tides that occur on a few days of each year. At these times, all of Moreton Bay's shorebirds are crowded into the limited roost areas, and disturbance during this time is more critical than usual. A significant number of these roosts are considered threatened by development as they lie outside the boundary of the Marine Park at the Highest Astronomical Tide (HAT) line.

Shorebirds are vulnerable to a number of threats throughout their range including habitat loss and degradation, pollution, hunting, and disturbance from people, dogs, competition, vehicles, vessels and exotic pests. The major threat in Queensland is the inadequate protection of shorebird roosting and feeding sites, and threats from pollution. Appendix C outlines the international and commonwealth mechanisms for protection of shorebirds and/or their habitat.

The Queensland Wader Study Group (QWSG) is one of many across Australia that are working towards the protection of shorebirds by providing scientific information, and advocating both for the preservation and wise management of their habitat. The QWSG is a special interest group within Birds Queensland.

To date the QWSG has completed the Great Sandy Strait Shorebird Roost Mapping Project Final report (QWSG, 2005) for the Great Sandy Strait. The QWSG also recently mapped shorebird habitat along the Burnett Mary Coast north of the Sandy Straits between Hervey Bay and Gladstone. The Australasian Wader Study Group has also completed a project to map Great Knot roosts in the Mackay region.

The QWSG recently mapped shorebird habitat and made a concurrent shorebird count across the entire Moreton Bay Ramsar Wetland. The habitat mapping to be undertaken for the Moreton Bay Regional Council (MBRC) project, that is the subject of this report, will inform and complement the broader Moreton Bay Mapping Study being undertaken for the Queensland Department of Environment and Resource Management in 2009.

Sunshine Coast Regional Council recently completed mapping of high and low tide roosts in and adjacent to Caloundra to inform their submission to the State Government on the Moreton Bay Marine Park Zoning Plan.

The Pumicestone Shorebird Management Group (PSMG) is a partnership between a developer, consultants, governments, the community and experts, to guide the management of shorebirds and their habitat in the Pumicestone Passage region. The PSMG formed in 2000 to facilitate the implementation of an environmental management plan – the Management Plan for Wader High-tide Roosts in Central-Southern Pumicestone Passage. The plan was developed to address a lack of shorebird roost management in the Pumicestone Passage, and the imminent removal of an artificially created roost on a construction site located on Bribie Island adjoining Pumicestone Passage. A list of PSMG members is provided in Appendix D.

In January 2007, the PSMG held a workshop focusing on the management of the recently enhanced southern Toorbul shorebird roost and other priority shorebird management actions in the southern Pumicestone Passage region. Specifically the workshop aims were to:

- Foster stewardship of the shorebird staging roost at southern Toorbul;
- Develop an agreed plan for the on-going management of the southern Toorbul roost in order to establish, maintain and demonstrate best practice standards for site maintenance as part of overall habitat management in the region; and
- Identify other priority shorebird management actions for the southern Pumicestone Passage region, and funding necessary to deliver them.

One of the actions that came out of the workshop was to “...acquire current mapping of shorebird feeding and roosting sites (and associated data) in the southern Pumicestone Passage and incorporate the relevant area into the Moreton Bay Regional Council Plan (during next appropriate planning scheme update) for consideration in the development assessment process”. This project aims to deliver on this action.

The project outputs will form part of Council’s Local Nature Conservation Strategy currently in development, which is a requirement under the SEQ Regional Plan and the Regional Nature Conservation Strategy. Ultimately they will inform future amendments to Council’s planning scheme.

2.2 Introduction

Pumicestone Passage is recognised as a wetland of international significance partly because of its importance to migratory shorebirds. Many shorebird species that visit the parts of Moreton Bay within Moreton Bay Regional Council jurisdiction in the summer months are also listed under international migratory bird treaties and so are protected under Commonwealth legislation as matters of national environmental significance. It is imperative that Council has a thorough understanding of the habitats and roosting requirements of these birds to better inform planning decisions.

The Moreton Bay Regional Council Shorebird Habitat Mapping Project ultimately aims to provide improved habitat protection and planning outcomes for shorebirds in MBRC jurisdiction. The project outputs will form part of Council’s Local Nature Conservation Strategy, currently in development. Ultimately they will inform future amendments to Council’s planning scheme. This will enable Council and other land managers to better conserve and appropriately manage important shorebird sites in the region.

Better planning by local governments is needed to help reduce the impacts of people on shorebirds. Councils need to be aware of the locations of shorebird high tide roosts when assessing new coastal development applications. They also need to be aware of the impact of disturbance on shorebird energy budgets and take steps to minimise disturbance to roosting shorebirds. The first step in improving planning assessments is to identify and map existing shorebird roosting habitats within each council’s jurisdiction. The Queensland Wader Study Group has been mapping shorebird high tide roosting habitats along the Queensland coast since 2003. High tide roosts in the Great Sandy Strait (Harding et al. 2005) north to Tannum Sands, near Gladstone (Milton and Harding 2007) have now been mapped and these data available for use in planning development assessment.

2.3 Project aims and objectives

- Liaise with council planning officers (and EPA officers) to determine roost attributes to be collected and information required for planning guidelines (provide Great Sandy Straits example);
- Extract the location details (latitude and longitude) of all shorebird high tide roosts in MBRC recorded in the Queensland Wader Study Group (QWSG) database;
- Plot the boundaries of these and other known shorebird roosts using GPS unit/s;
- Liaise with Council's GIS officers to generate a map of shorebird high tide roosts (using the GPS data) to inform the relevant local government planning scheme;
- Develop a simple set of guidelines to support the map of shorebird high tide roosts, also to inform the relevant local government planning scheme, including general shorebird information, threats and management considerations;
- Seek QWSG and EPA endorsement of the habitat mapping data and planning guidelines; and
- Identify and formalise procedures for ongoing sharing of QWSG shorebird count data with local government to guide decision-making.

2.4 Project scope and methodology

The project scope extends to the mapping of shorebird high tide roosts that require protection within MBRC boundaries, the development of planning guidelines to guide decision-making in the development assessment process and formalising procedures for data sharing arrangements.

The preferred methodology to be adopted for the mapping of the high tide roosts is that adopted by the QWSG for the Great Sandy Strait Shorebird Roost Mapping Project (Harding et al., 2005).

2.5 Key milestones and deliverables

The project has five key milestones including:

- Planning Phase
- Field Work Phase
- Desktop Phase
- Reporting Phase
- Evaluation Phase

The two (2) key deliverables from this project include:

- Mapping of high tide roosts
- Planning Guidelines

2.6 Project Team

Project Role	Position	Interest
David Milton	QWSG committee member	Principal author of report, extensive experience with shorebird mapping along central and south-eastern Qld coast
Jill Denning	QWSG member and local shorebird expert	Extensive experience of shorebirds in Pumicestone Passage and adjacent Sunshine Coast. Responsible for mapping of roosts
Erin Porter	Coordinator Catchments & Coastal Management Planning (Policy), Moreton Bay Regional Council	Project Manager (internal)
Michael Messer	Senior Environmental Planner, Moreton Bay Regional Council	Project Manager (internal)/Review of planning guidelines and mapping outputs for incorporation into Planning Scheme as future amendment
Catherine Rollo	Strategic Planner, Moreton Bay Regional Council	Review of planning guidelines and mapping outputs for incorporation into Planning Scheme as future amendment
Siobhan Bland	Coordinator Biodiversity & Natural Environment (Policy)	Review of planning guidelines and mapping outputs for incorporation into Planning Scheme as future amendment
Steve Agioritis	Senior GIS Officer, Moreton Bay Regional Council	GIS advice, mapping of digital data and review
Nicola Udy	Manager, Moreton Bay Marine Park, Queensland Parks and Wildlife Service	Review of planning guidelines and mapping data

3. SHOREBIRD ROOST HABITAT MAPPING

3.1 Roost habitat classification

The Queensland Wader Study Group (QWSG) has been undertaking counts of shorebirds at their high tide roosts in Moreton Bay since 1992. As part of these surveys, QWSG have developed a roost habitat classification system (Table 3.1). This classification system identified the major characteristics of the habitats used by shorebirds at high tide. This habitat classification system has been applied to high tide roosts throughout Queensland that have been surveyed by QWSG.

Table 3-1 The roost habitat codes used to define all shorebird high tide roosts mapped by QWSG members. Each roost was defined by a combination of up to six of the habitat codes depending on its characteristics. For example, a roost on an open sandy beach would have a habitat code of TOCS, whereas a roost on a muddy spit in a brackish mangrove creek could have a code of TEBM.

Site location	Code	Water definition	Code	Substrate	Code
Coastal tidal	T	Marine	C	Sand	S
Coastal non-tidal	N	Freshwater	F	Mud	M
Coastal open water	O	Brackish	B	Rock	R
Coastal bay, inlet or estuary	E	Dry	D	Other (specify)	X
Coastal lake, swamp or lagoon	L				
Inland (> 10 km from sea or estuary)	I				

3.1.1 Roost habitat types within Moreton Bay Regional Council jurisdiction

Shorebirds are a group of mostly migratory birds that feed along the margins of wetlands, especially coastal intertidal flats. They breed at high latitudes in the northern hemisphere and spend their non-breeding season (September – April) along the coast of countries in the southern hemisphere. This life cycle is believed to have evolved as an adaptation to the limited feeding habitats in tropical regions due to the narrow tidal range.

Moreton Bay hosts up to 40,000 shorebirds of 42 species of shorebird during the summer (Appendix C). Shorebirds are governed by the daily tidal cycles and will feed both day and night during low tide. At high tide, they move above the high water line to suitable open areas near their feeding grounds to rest and digest their food. These high tide resting areas are known as “roosts” (Appendix A) and can be classified into a range of broad categories based on their physical locations and characteristics. Most species only roost on the ground in supratidal areas with a clear view of their surroundings. However, three species found in MBRC area (Grey-tailed Tattler, Terek Sandpiper and Whimbrel) will often also use exposed tree branches to roost.

High tide roosts are usually within 1-2 km of the feeding grounds of shorebirds. In Moreton Bay, QWSG has found individual shorebirds show a strong daily fidelity to their feeding and

roosting areas. Where possible, they use the same roost each high tide and move between the roost and their intertidal feeding areas twice a day. Roosts are chosen for their landscape features that allow clear view of predators (including people and their pets) and safety from regular disturbance. Shorebirds try to keep energy expenditure on unnecessary flight to a minimum in order to convert food to stored fat. This fat fuels their long (up to 10,000 km non-stop) flights to and from their northern hemisphere breeding grounds. Thus, access to productive feeding grounds and safe high tide roosts nearby that allow rest with minimal disturbance are both critical for successful annual migrations.

In many parts of Moreton Bay, the gradients are quite shallow along the margins of the bay. This means that open areas, such as beaches, that may be used as a roost during moderate (up to 2.2 m) high tides may be covered in water at some times of the month and year when tides are much higher. At these times, the shorebirds are forced to fly further at high tide and congregate in the few roosts that remain above high water. These roosts may not be used during other tides, but are critical for the shorebirds during these spring (2.2 – 2.4 m) and king (>2.4 m) tides each year. QWSG estimate that there are only about 15 king tide roosts available throughout Moreton Bay to hold 40,000 shorebirds. Moreton Bay Regional Council has five of these critical king tide roosts.

A total of 28 high tide roosts used by shorebirds on most high tides were identified within MBRC from the QWSG count database and site visits (see Section 3.2.1 below for details). Among the roosts, there were five different habitat classifications identified (Table 3.2). In order to better understand the types of habitats present in each roost habitat classification, photographs of an example of each habitat classification are provided.

Roost habitat TECM

These roosts are mostly large claypans and often used by large numbers of shorebirds, especially on spring and king high tides (Figure 3.1).

Roost habitat TECSMR

These roosts are a mixture of sand and mud beaches with rock ledges that are used as a roost by some species as the tide comes in (Figure 3.2)

Roost habitat TECSM

These roosts are mostly on beaches along the foreshore of Pumicestone Passage (Figure 3.3).

Roost habitat TECS

Typically, roosts classified as TECS are sandspit roosts like Buckley's Hole sandspit (Figure 3.4)

Roost habitat LFSM

An unusual roost habitat that occurs rarely in coastal areas. There are few freshwater lakes near the foreshore of Moreton Bay and close to coastal low-tide feeding habitats (Figure 3.5).

Roost habitat TECMR

An uncommon roost habitat classification. Usually only found on promontories and other exposed sites (Figure 3.6).



Figure 3-1 Donnybrook claypan roost (Type 1) on a spring high tide showing a large flock of shorebirds at a typical TECM roost type.



Figure 3-2 Roost habitat TECSMR at Sandstone Pt (Type 1) looking across to Bribie Is on an incoming tide.



Figure 3-3 Toorbul north roost (Type 1) (habitat TECSM) on a king high tide showing the mixed sandy mud habitat typical of this roost habitat classification.



Figure 3-4 Roost habitat TECS on the Buckley's Hole sandspit (Type 1) at southern end of Bribie Is. This site is a **critical** king tide roost that is subject to extensive regular disturbance from people.



Figure 3-5 Typical roost habitat LFSM at Buckley's Hole lagoon (Type 1) on Bribie Is



Figure 3-6 The Deception Bay central roost (Type 2: staging roost) (habitat TECMR) on a rising tide showing the mud and rock substrate and two dogs that had chased shorebirds prior to the photograph being taken.



Figure 3-7 An example of a Type 3 tree roost in Hays Inlet (not mapped) used occasionally by Terek Sandpipers on the high tide. Predation can often be low at these tree roosts as they are usually separated from the adjacent mangroves and the birds have good visibility.

3.2 MBRC shorebird high tide roosts

The locations of shorebird high tide roosts within MBRC had been identified by QWSG members over the last 15 yrs. Several aerial surveys of the less accessible parts of the shire, such as Pumicestone Passage, have been undertaken to locate roosts. These roosts have all been visited previously on several occasions by Ms J. Denning. Additionally, QWSG member, Ken Cowell also made an aerial reconnaissance of Pumicestone Passage in January 2008 to identify any potentially new roosts. No new roosts were identified during this survey. Surveys of the southern section of the MBRC jurisdiction from Redcliffe airport south to the North Pine River were undertaken in late March-early April 2009 in association with MBRC staff and Mr Cowell. The known roosts (Table 2.2) were then visited specifically to undertake the shorebird roost habitat mapping by Ms Denning.

3.2.1 Roost site mapping methods

In order to accurately define each roost, a field visit was made to each site at a moderate to spring high tide during February 2008 (north and central MBRC) and April 2009 (south). Aerial photographs (<1:10,000) of each roost were obtained from MBRC prior to the visits. Ms Denning made fixes at each roost with a GPS set on datum WGS84. Once on site, a series of photographs of the roost were taken, the boundaries of the roost were walked and GPS fixes taken at several points around the boundaries. The location of each fix was noted on the aerial photograph and assigned a number. GPS fixes, roost habitat characteristics (Table 2.1) and known or potential threats were listed on a field sheet. These data were used to produce Table 2.3 and the annotated aerial photographs were returned to the MBRC GIS officer for digitising and production of the GIS polygon of each roost.

3.2.2 Summary of shorebird roost data

To support the shorebird GIS layer in the MBRC Planning Department GIS system, available information on each shorebird roost has been summarised. For each roost, the average and maximum number of each shorebird species using the roost, the number of times each species was seen at each roost, the roost habitat characteristics and threats to its viability as a roost are described (Table 3.3). These data are to be used in conjunction with the GIS developed within MBRC and provide the facts to support their definition as a shorebird high tide roost.

A simple guideline for planners has also been developed as a separate stand alone document to support the GIS (Appendix E). These guidelines suggest recommendations for buffer distances between developments and roosts, screening between public walkways along foreshore parks and reserves and coastal lighting. The guideline also provides some general background about shorebirds and their habitat needs and is written in plain English.

Table 3-2 The list of the high tide roosts in within the Moreton Bay Regional Council boundary, the roost type and its habitat classification. The characteristics of each of these roosts are described in detail in Table 3.3.

No	QWSG site code	QWSG roost name	Roost type	Habitat classification
1	LIPK	Lime Pocket	1 and 3	TECSM
2	GMCK	Glass Mountain Creek claypan	1	TECM
3	GMTR	Glass Mountain Creek tree roost	3	TECM
4	MIPT	Mission Point	1	TECSM
5	PCMP	Poverty Creek behind Mission Point	1	TECM
6	POCK	Poverty Creek	1	TECS
7	DOJT	Donnybrook Jetty	1	TECSM
8	DONN	Donnybrook claypan	1	TECM
9	BULL	Bullock Ck mouth claypan	1	TECM
10	TRCC	Toorbul Crescent	1	TECM
11	TRSS	Toorbul sandspit	2	TECSM
12	TRNT	Toorbul north	1	TECSM
13	TRSF	Toorbul Sandfly Bay	1	TECSM
14	TOOR	Toorbul main roost	1	TECSM
15	KKBC	Kakadu Beach	1	TECS
16	DUCR	Dux Creek, Bribie Island	1	TECM
17	SAPT	Sandstone Point	1	TECSMR
18	BUCK	Buckley's Hole lagoon	1	LFSM
19	BHBI	Buckley's Hole sandspit, Bribie Island	1	TECS
20	GOBC	Godwin Beach	2	TECSM
21	CABO	Caboolture River mouth	1	TECM
22	DBBA	Deception Bay claypan	1	TECM
23	DBFR	Deception Bay central (DPI)	2 and 3	TECMR
24	DBMN	Deception Bay south	1	TECM
25	RANS	Redcliffe Airport North side	1	TECM
26	NARD	Nathan Rd Redcliffe wetland	1	LFM
27	CTFW	Clontarf west	1	TECM
28	PRNS	Pine Rivers north	1	TECM

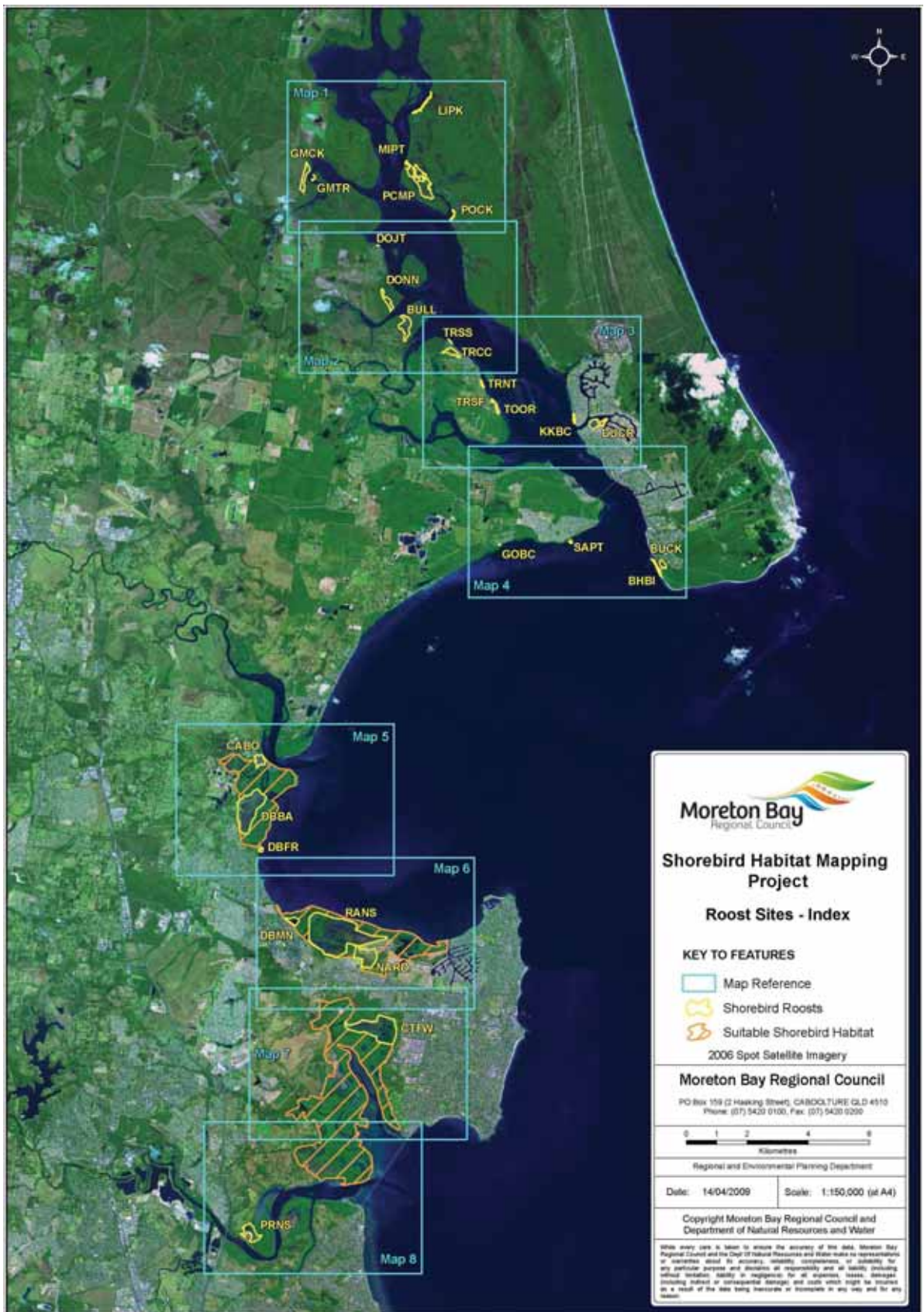


Figure 3-8 Index map of the Moreton Bay Regional Council jurisdiction showing the locations of all 28 shorebird high tide roosts and the eight more detailed inset maps.

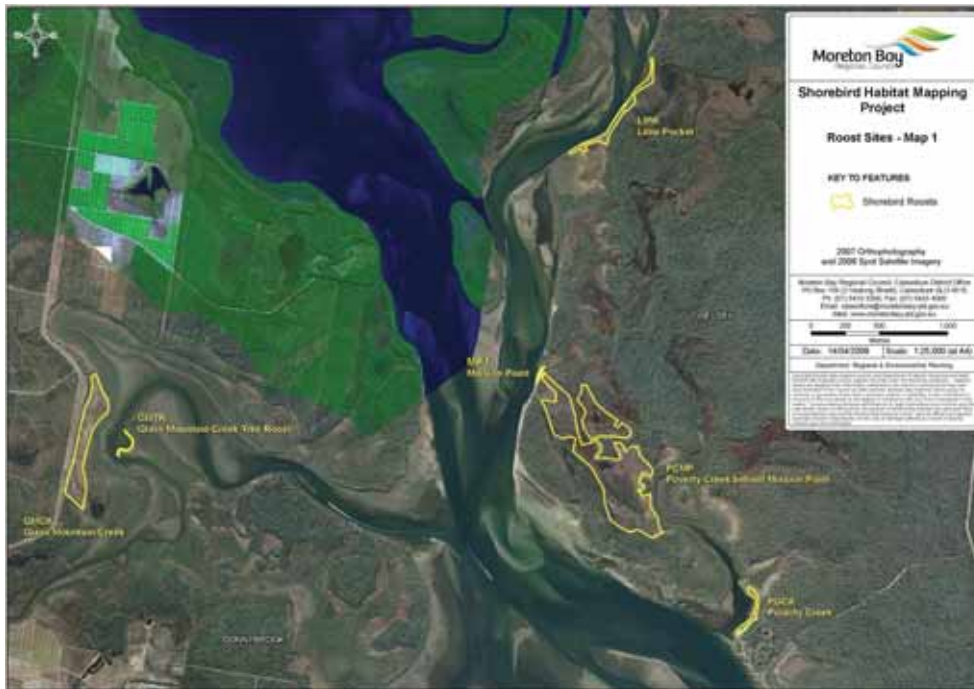


Figure 3-9 Map 1 showing the shorebird high tide roosts in the northern part of Moreton Bay Regional Council jurisdiction in Pumicestone Passage. See Table 3.3 below for shorebird species composition at each roost, their roost characteristics and threats.



Figure 3-10 Map 2 showing the shorebird high tide roosts on the mainland side of central Pumicestone Passage. See Table 3.3 below for shorebird species composition at each roost, their roost characteristics and threats.



Figure 3-11 Map 3 showing shorebird high tide roosts in the southern part of Pumicestone Passage. See Table 3.3 below for shorebird species composition at each roost, their roost characteristics and threats.



Figure 3-12 Map 4 showing shorebird high tide roosts on southern Bribie Is and adjacent mainland parts of northern Deception Bay. See Table 3.3 below for shorebird species composition at each roost, their roost characteristics and threats.



Figure 3-13 Map 5 showing the shorebird high tide roosts in Deception Bay. See Table 3.3 below for shorebird species composition at each roost, their roost characteristics and threats.



Figure 3-14 Map 6 showing Deception Bay South (DBMN), the large roost in southern Deception Bay (QWSG code: RANS) and the nearby freshwater wetland (NARD). See Table 3.3 below for shorebird species composition, roost characteristics and threats.



Figure 3-15. Map 7 showing the known high tide roost in Hays Inlet, west of Redcliffe. Also shaded is the extent of potential roosting habitat in the area that remain unsurveyed due to inaccessibility during the project period. See Table 3.3 below for shorebird species composition, roost characteristics and threats

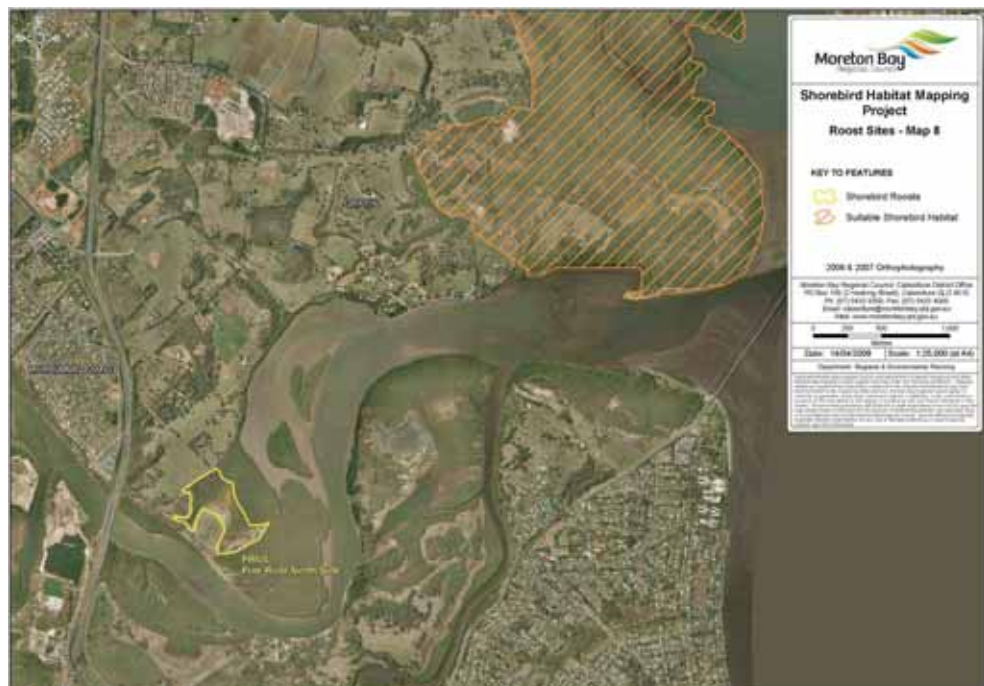


Figure 3-16. Map 8 showing the high tide roosts in the mouth of the North Pine River and the southern extent of the potential shorebird roosting habitat on Map 7 (Fig. 3.15). See Table 3.3 below for shorebird species composition, roost characteristics and threats.

Table 3-3 The shorebird roost sites within Moreton Bay Regional Council (MRC) jurisdiction identified by J. Dening and QWSG in February 2008 and April 2009. Roost names and codes correspond with that used in the QWSG count database provided to MBRC. Roost characteristics are taken from the habitat codes in Table 3.1 above. The number of counts (made before April 2009) gives an indication of data precision and accuracy. Name in bold are migratory species listed under the federal EPBC Act 1999.

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
1	Lime Pocket Pumicestone Passage	LIPK	Australian White Ibis	8	12	2	Habitat code: TECSM	Regularly disturbed by fishers and boat users that stop on the bank to recreate or camp.
			Bar-tailed Godwit	2	3	2	Type 1 and 3	
			Black-necked Stork	1.75	2	4	Site is a mixture of low-lying sedge swamp	
			Black-winged Stilt	82.5	402	12	fronted by a sandy beach and bank. Birds use the beach, swamp and also roost in a small patch of mangrove trees in the middle of the site.	
			Brahminy Kite	1	1	1		
			Curlew Sandpiper	26.25	100	4		
			Great Egret	1	1	1		
			Common Greenshank	15.25	30	4		
			Grey-tailed Tattler	159.25	300	8		
			Masked Lapwing	1.5	2	2		
			Osprey	1.33	2	3		
			Pied Oystercatcher	2	2	4		
			Straw-necked Ibis	3	3	1		
			Terek Sandpiper	16.5	30	4		
			Whistling Kite	1.5	2	2		
			White-faced Heron	1.33	2	3		
2	Glass Mountain Ck claypan	GMCK	Bar-tailed Godwit	8	11	2	Habitat code: TECM	Very low disturbance level because of difficulty of access for vehicles or people.
			Black-winged Stilt	16	17	2	Type 1	
			Chestnut Teal	6	6	1	A claypan behind fringing mangroves of Glass Mountain Ck backed by state forestry land.	
			Common Greenshank	8	11	2		
			Crested Tern	1	1	1		
			Eastern Curlew	15	15	1		
			Great Egret	1	1	1		
			Grey-tailed Tattler	100	100	1		
			Masked Lapwing	2	2	1		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
3	Glass mountain Ck tree roost	GMTR	Whimbrel	47.7	100	3		
			Black-winged Stilt	8.7	20	3	Habitat code: TECM	Very low threat, as only accessible by boat. Some fishers may disturb birds from time to time.
			Brahminy Kite	1	1	1	Type 3	
			Common Greenshank	8	8	1	Mangrove roost which provides roosting on all tides, with open access to view approaching predators.	
			Sharp-tailed Sandpiper	4	4	1		
			Straw-necked Ibis	7	7	1		
			Terek Sandpiper	250	500	4		
			Whimbrel	15	15	1		
			White-bellied Sea-Eagle	1	1	1		
			Australian Pelican	2	3	2	Habitat code: TECSM	Site is major campsite for boat users in Pumicestone Passage and is disturbed constantly during high use periods such as weekends.
			Australian White Ibis	7	7	1	Type 1	Shorebird sign on roost appears to be completely ineffective.
			Bar-tailed Godwit	86.2	258	9		
			Black-tailed Godwit	2	2	1	Site is fronted by a sandy beach and mud bank.	
4	Mission Point	MIPT	Black-winged Stilt	138.4	404	12	Birds use the beach and grassy swamp behind the beach.	
			Brahminy Kite	1	1	1		
			Caspian Tern	5.5	9	2		
			Curlew Sandpiper	1	1	1		
			Eastern Curlew	50.3	88	3		
			Great Egret	1	1	2		
			Great Knot	50.25	181	4		
			Grey-tailed Tattler	188.2	350	5		
			Gull-billed Tern	29	113	6		
			Masked Lapwing	1.5	2	2		
			Pied Oystercatcher	2	2	7		
			Royal Spoonbill	7	7	1		
			Sharp-tailed Sandpiper	2	2	1		
Terek Sandpiper	310	600	2					
Whimbrel	75	75	1					
Whistling Kite	1.3	3	3					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
5	Poverty Creek behind Mission Point	PCMP	White-bellied Sea-Eagle	1.5	2	2		
			Australian Darter	1	1	1	Habitat code: TECM	Site fringed by a dense stand of mangroves and so
			Australian White Ibis	12.6	35	16	Type 1	human disturbance is minimal. Cattle, horses and dingoes will disturb birds occasionally.
			Bar-tailed Godwit	33.6	80	5		
			Black Swan	2	2	1	The site comprises a series of interlinked claypans west and north-west of Poverty Ck and extending to Mission Point (MIPT). Claypans are separated by pockets of denser taller vegetation (<i>Casuarina</i>). Birds roost in different parts of site depending on tide height.	
			Black-necked Stork	1	1	1		
			Black-winged Stilt	18.6	50	8		
			Brahminy Kite	1	1	1		
			Chestnut Teal	11.2	20	5		
			Curlew Sandpiper	3.5	4	2		
			Eastern Curlew	199.1	600	15		
			Great Egret	12	2	5		
			Great Knot	8	8	1		
			Common Greenshank	39.3	100	12		
			Intermediate Egret	1	1	1		
			Little Black Cormorant	1	1	1		
			Little Egret	5	9	5		
Marsh Sandpiper	2.75	5	4					
Masked Lapwing	3.9	8	19					
Osprey	1.5	2	2					
Pacific Golden Plover	10.7	17	6					
Pied Cormorant	2	2	1					
Pied Oystercatcher	2	2	3					
Red-capped Plover	9.8	41	14					
Red-kneed Dotterel	2.5	4	2					
Red-necked Stint	5.5	7	2					
Royal Spoonbill	13	14	2					
Sharp-tailed Sandpiper	48.6	118	5					
Straw-necked Ibis	8.7	15	3					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
6	Poverty Ck Bribe Is	POCK	Striated Heron	1	1	1		
			Whimbrel	30.7	110	10		
			Whistling Kite	1.4	2	5		
			White-bellied Sea-eagle	1	1	1		
			White-faced Heron	14.8	38	16		
			Australian Pelican	1.5	2	2	Habitat code: TECS	Disturbed by campers from the nearby campground at the entrance to Poverty Ck. Fishers and other boat users would also occasionally disturb the birds.
			Australian White Ibis	3.33	6	3	Type 1	
			Bar-tailed Godwit	226.3	550	10	An important roost on neap and intermediate tides. Comprises a sandy beach fronting a shallow sedge swamp that is preferred habitat for several species. Site is flooded on spring tides.	
			Black-tailed Godwit	208.1	350	8	Mangrove growth is diminishing the viability of the roosting area.	
			Black-winged Stilt	115.7	392	26		
			Brahminy Kite	2	2	2		
			Chestnut Teal	72	72	1		
			Curlew Sandpiper	10	20	7		
			Eastern Curlew	1.33	2	3		
			Great Egret	1.5	2	2		
			Great Knot	187.9	300	7		
			Common Greenshank	50.2	150	12		
Grey-tailed Tattler	128.4	520	17					
Little Egret	1	1	1					
Little Pied Cormorant	1.2	2	5					
Marsh Sandpiper	1.5	2	2					
Masked Lapwing	2.44	4	9					
Pied Cormorant	2	2	1					
Pied Oystercatcher	1.6	4	5					
Red-capped Plover	110	110	1					
Rufous Night-heron	12	12	1					
Royal Spoonbill	3	3	1					
Ruddy Turnstone	3	6	3					
Sharp-tailed Sandpiper	9.5	10	2					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
7	Donnybrook Jetty	DOJT	Striated Heron	1	1	1		
			Terek Sandpiper	11.7	30	11		
			Whimbrel	4.9	17	8		
			Whistling Kite	1.8	4	10		
			White-bellied Sea-Eagle	1	1	5		
			Australian Pelican	6.4	11	5	Habitat code: TECSM	Heavily disturbed as it is adjacent to houses on the northern edge of Donnybrook town.
			Bar-tailed Godwit	3	3	1	Type 1	Users of the jetty and people recreating on the beach also disturb the birds.
			Black-winged Stilt	145	290	13	A small sandy beach on the mainland side of	
			Brahminy Kite	1	1	3	Pumicestone Passage near	
			Common Greenshank	7	13	2	the Donnybrook Jetty.	
			Eastern Curlew	1	1	1	Used intermittently by several species on neap and intermediate high tides.	
			Grey-tailed Tattler	105.7	263	3		
			Little Black Cormorant	1	1	1		
			Little Egret	1	1	1		
			Little Pied Cormorant	1	1	2		
Pied Oystercatcher	2	2	1					
Royal Spoonbill	1	1	1					
Silver Gull	1	1	2					
Straw-necked Ibis	1	1	1					
White-bellied Sea-Eagle	1	1	1					
8	Donnybrook claypan	DONN	Australian Darter	1	1	2	Habitat code: TECM	Minimally disturbed site, as the occasional users only go there at low tide. Occasional disturbance by foxes noted.
			Australian Pelican	2.1	6	18	Type 1	
			Australian White Ibis	5.1	26	68	A large claypan south of Donnybrook town behind the fringing mangroves on the northern side of the entrance to Bullock Ck.	
			Bar-tailed Godwit	460.7	2000	75		
			Black-fronted Dotterel	5.4	18	7		
			Black-necked Stork	11	11	1		
			Black-tailed Godwit	63.7	500	42		
			Black-winged Stilt	23.8	150	58	A critical spring high tide roost. One of the	
			Brahminy Kite	1.5	4	21		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Caspian Tern	1.4	3	17	supporting the most	
			Chestnut Teal	6.7	19	31	species in MBRC area (47 spp). It supports a large	
			Crested Tern	3.5	6	2	numbers of shorebirds	
			Curlew Sandpiper	34.1	300	57	and waterbirds on spring	
			Eastern Curlew	63.7	429	84	high tides.	
			Great Egret	1.3	4	29		
			Great Knot	140.1	600	48		
			Greater Sand Plover	11.7	32	3		
			Common Greenshank	36.6	200	89		
			Grey Plover	1	1	1		
			Grey Teal	4	4	1		
			Grey-tailed Tattler	19.5	77	12		
			Gull-billed Tern	32.5	121	19		
			Intermediate Egret	1.2	2	6		
			Lesser Sand Plover	2	2	1		
			Little Black Cormorant	1	1	1		
			Little Egret	2.5	10	37		
			Little Pied Cormorant	4.5	8	2		
			Marsh Sandpiper	15.4	54	49		
			Masked Lapwing	2.2	5	29		
			Osprey	1.1	2	15		
			Pacific Black Duck	1	1	1		
			Pied Oystercatcher	2.1	4	56		
			Red Knot	14	56	21		
			Red-capped Plover	5.3	18	26		
			Red-kneed Dotterel	2	3	2		
			Red-necked Avocet	9.4	20	7		
			Red-necked Stint	4	14	10		
			Royal Spoonbill	16	28	2		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats	
9			Sharp-tailed Sandpiper	21.1	141	27			
			Silver Gull	2	4	5			
			Straw-necked Ibis	2.5	4	2			
			Whimbrel	99.3	500	91			
			Whiskered Tern	9	9	1			
			Whistling Kite	1.6	5	62			
			White-bellied Sea-Eagle	1.3	3	25			
			White-faced Heron	3.9	18	76			
			Australian Darter	1	1	1			
		Bullock Ck mouth claypan	BULL	Australian White Ibis	1.3	10	4	Habitat code: TECM Type 1	Highly disturbed at times by trailbike riders and other recreational vehicles. Saltmarsh is considerably damaged by vehicles. Dogs and walkers are probably a disturbance because of nearby housing and easy access.
				Bar-tailed Godwit	1	1	1		
				Caspian Tern	3	3	1		
				Eastern Curlew	108.5	167	2		
				Great Egret	1	1	1		
				Gull-billed Tern	12	12	1		
				Little Egret	2	2	1		
				Masked Lapwing	1.5	2	2		
			Pied Cormorant	2	3	2			
			Pied Oystercatcher	2	2	1			
			Red-capped Plover	3	4	3			
			Sharp-tailed Sandpiper	1	1	1			
			Whimbrel	8	8	1			
			Whistling Kite	1	1	3			
			White-bellied Sea-Eagle	1	1	2			
			White-faced Heron	13	13	1			
			Australian Pelican	2	2	1			
			Australian White Ibis	5.8	16	12	Habitat code: TECM Type 1	Disturbance by people walking pets would occur regularly.	
	The Crescent Toorbul	TRCC	Black-tailed Native Hen	1	1	1			
			Black-winged Stilt	5.5	10	4			

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
11	Toorbul sandspit	TRSS	Cattle Egret	1	1	1	An ephemeral wetland	
			Chestnut Teal	8.8	30	6	with samphire flat at the northern end of the	
			Eastern Curlew	1	1	2	Toorbul Esplanade that is	
			Great Egret	1.2	2	5	mainly used by waterbirds, and a few shorebirds, especially during	
			Intermediate Egret	1.3	2	4	migration (Sept-Oct and Mar-April). A site used	
			Little Egret	1	1	1	by species not usually present on the larger coastal roosts.	
			Maned Duck	3	3	1		
			Masked Lapwing	2.9	6	16		
			Pacific Black Duck	4	6	2		
			Pacific Golden Plover	10.5	16	2		
			Sharp-tailed Sandpiper	71	71	1		
			Straw-necked Ibis	1	1	2		
			Whimbrel	12.5	19	2		
			Whistling Kite	1	1	2		
			White-faced Heron	3.6	21	17		
			Australian Darter	1.67	2	6	Habitat code: TECSM	Regularly disturbed by beach users along the Toorbul foreshore.
			Australian Pelican	1.7	4	37	Type 2	
			Australian White Ibis	3.5	32	28		
			Bar-tailed Godwit	91.8	350	89	A sandspit on the foreshore of the northern	
			Black Swan	49	180	17	part of Toorbul that is used on neap and intermediate high tides by a diversity of shorebirds and waterbirds.	
Black-fronted Dotterel	2	2	1					
Black-tailed Godwit	6	15	3					
Black-winged Stilt	36	170	96					
Brahminy Kite	1.25	2	8					
Caspian Tern	5.6	28	65					
Crested Tern	2.5	6	16					
Curlew Sandpiper	4	4	1					
Eastern Curlew	3.4	31	45					
Great Egret	1.25	3	16					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Great Knot	23.9	80	20		
			Common Greenshank	5	12	16		
			Grey-tailed Tattler	18.5	80	15		
			Gull-billed Tern	14.2	83	16		
			Little Black Cormorant	56.75	224	4		
			Little Egret	1	1	4		
			Little Pied Cormorant	2.5	7	32		
			Little Tern	2	3	3		
			Marsh Sandpiper	1	1	1		
			Masked Lapwing	1.8	3	33		
			Osprey	1	1	2		
			Pacific Golden Plover	9.5	26	10		
			Pied Cormorant	3.3	6	3		
			Pied Oystercatcher	1.8	2	45		
			Royal Spoonbill	4.6	14	8		
			Ruddy Turnstone	1	1	1		
			Sharp-tailed Sandpiper	27	27	1		
			Silver Gull	2.4	28	41		
			Terek Sandpiper	8.6	21	5		
			Whimbrel	4.7	24	23		
			Whistling Kite	1.4	3	5		
			White-bellied Sea-Eagle	2.7	6	3		
			White-faced Heron	2	10	19		
			Australian Pelican	8.4	82	260	Habitat code: TECSM	Nearby road and foreshore park
			Australian White Ibis	5.3	92	150	Type 1	enable people and pets to come close to the birds. Birds can become
			Bar-tailed Godwit	376.9	3100	279		
			Black Swan	48.6	231	14	An important high tide roost used by a large variety of shorebirds on	
			Black-tailed Godwit	18.7	250	60		
12	Toorbul north	TRNT		94.6	500	191		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Brahminy Kite	1	1	18	most tides. Site is a	accustomed to
			Broad-billed Sandpiper	1.5	2	2	raised samphire beach	disturbance and
			Brown Falcon	1	1	1	along the Toorbul	reduce their flight
			Caspian Tern	6	78	130	foreshore. Growth of	distance as there are
			Cattle Egret	2	2	1	mangroves may limit	few alternative roost
			Chestnut Teal	19.2	77	29	usage in the future.	sites nearby.
			Common Tern	1	1	1		
			Crested Tern	8.4	46	10		
			Curlew Sandpiper	12.54	135	105		
			Eastern Curlew	35.1	644	104		
			Great Egret	1.5	6	35		
			Great Knot	73.3	540	196		
			Greater Sand Plover	5.5	9	2		
			Common Greenshank	13.7	70	173		
			Grey Plover	4	7	2		
			Grey-tailed Tattler	43	300	123		
			Gull-billed Tern	9.7	77	102		
			Intermediate Egret	1.4	4	15		
			Lesser Sand Plover	24.7	53	6		
			Little Black Cormorant	2	2	2		
			Little Egret	1.8	10	55		
			Little Pied Cormorant	2.3	6	14		
			Little Tern	1.6	3	5		
			Maned Duck	5.8	20	39		
			Marsh Sandpiper	5.6	20	8		
			Masked Lapwing	2.5	8	138		
			Osprey	1.1	3	30		
			Pacific Black Duck	3.5	8	6		
			Pacific Golden Plover	2	2	1		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
13	Toorbul sandfly	TRSF	Pied Oystercatcher	2.2	8	265		
			Red Knot	9.6	100	60		
			Red-necked Avocet	2	2	1		
			Red-necked Stint	6	9	2		
			Royal Spoonbill	7	25	7		
			Ruddy Turnstone	10.9	54	103		
			Sharp-tailed Sandpiper	3.25	10	20		
			Silver Gull	42.7	528	91		
			Straw-necked Ibis	8.4	75	236		
			Striated Heron	1.6	5	11		
			Terek Sandpiper	1	1	2		
			Whimbrel	19.1	302	80		
			Whistling Kite	1.1	2	43		
			White-bellied Sea-Eagle	1.25	2	4		
			White-faced Heron	2.5	17	115		
			Australian Darter	1	1	2	Habitat code: TECSM	Nearby road and foreshore park
			Australian Pelican	5.9	37	25	Type 1	enable people and
Australian White Ibis	4.2	20	39		pets to come close			
Bar-tailed Godwit	214.3	2000	79	An important high tide roost used by a large	to the birds. Birds			
Black Swan	14.5	50	11	variety of shorebirds on	can become			
Black-necked Stork	1	1	1	most tides. Site is a	accustomed to			
Black-tailed Godwit	12.9	52	8	raised beach along the	disturbance and			
Black-winged Stilt	59.3	300	36	Toorbul foreshore. Forms	reduce their flight			
Brahminy Kite	1	1	6	the second of three	distance as there are			
Caspian Tern	3.6	17	30	interconnected roosts	few alternative roost			
Cattle Egret	5	5	1	along the Toorbul	sites nearby.			
Chestnut Teal	29	29	1	foreshore.				
Common Tern	2	2	1					
Curlew Sandpiper	11	43	34					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Eastern Curlew	113.5	496	85		
			Great Egret	1.4	5	13		
			Great Knot	71.5	500	50		
			Greater Sand Plover	4	7	2		
			Common Greenshank	10.5	37	27		
			Grey Plover	1.2	2	17		
			Grey-tailed Tattler	80	440	48		
			Gull-billed Tern	12.6	72	20		
			Intermediate Egret	1	1	3		
			Lesser Sand Plover	51.4	152	8		
			Little Black Cormorant	10	10	1		
			Little Egret	1.1	2	8		
			Little Pied Cormorant	3.5	8	21		
			Little Tern	3	3	1		
			Maned Duck	4	9	3		
			Marsh Sandpiper	2	2	1		
			Masked Lapwing	1.9	6	28		
			Osprey	1.1	2	7		
			Pacific Golden Plover	1	1	1		
			Pied Cormorant	6.2	16	6		
			Pied Oystercatcher	1.9	4	54		
			Red Knot	18.2	88	13		
			Red-necked Stint	12.7	37	11		
			Royal Spoonbill	14.75	34	4		
			Ruddy Turnstone	2	3	6		
			Ruff	1.2	2	5		
			Sharp-tailed Sandpiper	21.6	73	16		
			Silver Gull	3.8	21	17		
			Sooty Oystercatcher	1	1	1		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Straw-necked Ibis	1	1	1		
			Terek Sandpiper	4.4	12	8		
			Whimbrel	65.1	300	64		
			Whistling Kite	1.3	3	9		
			White-bellied Sea-Eagle	1	1	2		
			White-faced Heron	2.3	6	29		
14	Toorbul	TOOR	Australian Darter	1.3	2	3	Habitat code: TECSM	Nearby road and foreshore park
			Australian Pelican	4.5	31	89	Type 1	enable people and
			Australian White Ibis	6.5	36	101		pets to come close
			Bar-tailed Godwit	500.5	3750	262	An important high tide	to the birds. Birds
			Black Swan	35.5	218	139	roost used by a large	can become
			Black-fronted Dotterel	1	1	1	variety of shorebirds on	accustomed to
			Black-necked Stork	1	1	1	most tides. Site is an	disturbance and
			Black-tailed Godwit	22.9	70	54	artificially-raised mound	reduce their flight
			Black-winged Stilt	66.6	400	143	at the southern end of the	distance as there are
			Brahminy Kite	1.1	2	16	Toorbul Esplanade.	few alternative roost
			Broad-billed Sandpiper	1.4	3	5	Forms the third of three	sites nearby. This
			Caspian Tern	8.5	78	204	interconnected roosts	roost is less
			Chestnut Teal	5.6	17	12	along the Toorbul	disturbed than other
			Common Tern	1.5	2	2	foreshore and is the only	roosts on foreshore
			Crested Tern	3.7	12	20	roost on the mainland that	as it is at the end of
			Curlew Sandpiper	36.4	500	182	can support shorebirds on	the esplanade.
			Double-banded Plover	1.8	2	5	spring high tides.	
			Eastern Curlew	87	1000	201		
			Great Egret	1.6	5	44		
			Great Knot	104	557	204		
			Greater Sand Plover	22.4	200	31		
			Common Greenshank	17	112	107		
			Grey Plover	1.1	2	13		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Grey Teal	13.3	23	3		
			Grey-tailed Tattler	165.8	800	220		
			Gull-billed Tern	11.7	64	153		
			Intermediate Egret	1.8	7	22		
			Lesser Sand Plover	52.4	320	60		
			Little Black Cormorant	2.7	6	6		
			Little Egret	10.9	400	45		
			Little Pied Cormorant	3.8	12	74		
			Little Tern	25.5	200	65		
			Maned Duck	11	57	31		
			Marsh Sandpiper	45	216	5		
			Masked Lapwing	3.1	13	128		
			Nankeen Night Heron	9	9	1		
			Osprey	1.3	3	61		
			Pacific Black Duck	14.5	24	2		
			Pacific Golden Plover	1.6	2	5		
			Pied Cormorant	4.9	52	14		
			Pied Oystercatcher	2.3	9	176		
			Red Knot	16.8	160	69		
			Red-capped Plover	6.8	19	23		
			Red-necked Avocet	1	1	1		
			Red-necked Stint	39.6	344	100		
			Royal Spoonbill	18.5	68	89		
			Ruddy Turnstone	4.7	15	76		
			Sharp-tailed Sandpiper	42.6	390	80		
			Silver Gull	5.1	24	92		
			Sooty Oystercatcher	1.9	6	28		
			Straw-necked Ibis	4.1	10	8		
			Striated Heron	1	1	12		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
15	Kakadu Beach Bribie Is	KKBC	Terek Sandpiper	9.4	63	79		
			Whimbrel	150.3	800	259		
			Whistling Kite	1.4	3	94		
			White-bellied Sea-Eagle	1.3	3	23		
			White-faced Heron	2.3	20	63		
			Wood Sandpiper	6	6	1		
			Australian Darter	1.2	2	5	Habitat code: TECS	Access to roost from the foreshore is restricted by fences, so disturbance from the landward side is minimal. Signage on the beach has reduced disturbance from fishers and boat users landing on the beach.
			Australian Pelican	2.7	9	69	Type 1	
			Australian White Ibis	1.3	4	25		
			Bar-tailed Godwit	481.6	2388	94	An artificial sand mound on beach adjacent to Kakadu Beach residential development. Designed at a spring high tide roost.	
			Beach Stone-curlew	1.7	3	10	A critical roost used by large numbers of shorebirds on king tides.	
			Black-tailed Godwit	7.3	15	6	Kakadu Beach residential development. Designed at a spring high tide roost.	
			Black-winged Stilt	8.7	35	72		
			Brahminy Kite	1.2	2	5		
			Broad-billed Sandpiper	2.5	5	4		
			Caspian Tern	6.3	42	116		
			Chestnut Teal	2.3	3	3		
Common Tern	1.5	2	2	Needs regular maintenance to retain its viability as a shorebird roost. Beach Stone-curlew (listed as Rare under the Qld Nature Conservation Act) has nested at this site.	However, some disturbance still occurs. QWSG counters report one of the highest rates of disturbance of any roost in Moreton Bay during regular counts.			
Crested Tern	3.1	27	82					
Curlew Sandpiper	7.6	70	27					
Double-banded Plover	11.5	45	20					
Eastern Curlew	11.4	126	83					
Great Cormorant	1	1	2					
Great Egret	1.1	2	9					
Great Knot	179.3	1270	51					
Greater Sand Plover	29.7	200	21					
Common Greenshank	2	2	1					
Grey Plover	1.1	3	35					
Grey-tailed Tattler	27	53	2					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Gull-billed Tern	18.8	114	83		
			Intermediate Egret	1	1	3		
			Lesser Crested Tern	1	1	2		
			Lesser Sand Plover	46.4	245	61		
			Little Black Cormorant	3.1	7	9		
			Little Egret	1	1	3		
			Little Pied Cormorant	1.2	3	18		
			Little Tern	18.5	85	20		
			Maned Duck	7.2	50	24		
			Masked Lapwing	2.4	11	98		
			Osprey	1.3	4	20		
			Pacific Black Duck	3.3	5	4		
			Pacific Golden Plover	11.5	97	16		
			Pied Cormorant	5.5	26	28		
			Pied Oystercatcher	6	30	130		
			Red Knot	8.7	44	7		
			Red-capped Plover	8.4	51	99		
			Red-necked Avocet	1	1	1		
			Red-necked Stint	50.6	360	61		
			Royal Spoonbill	2.5	4	2		
			Ruddy Turnstone	1.1	2	9		
			Sharp-tailed Sandpiper	7.2	66	16		
			Silver Gull	8.5	75	143		
			Sooty Oystercatcher	2.2	4	27		
			Straw-necked Ibis	3.8	19	13		
			Striated Heron	1	1	12		
			Terek Sandpiper	2.2	4	5		
			Whimbrel	2.9	50	29		
			Whistling Kite	1.2	4	49		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats	
16	Dux Ck Bribe Is	DUCR	White-bellied Sea-Eagle	1.1	2	13			
			White-faced Heron	1.2	3	24			
			White-winged Black Tern	7	7	1			
			Asiatic Dowitcher	3	3	1	Habitat code: TECM	Little disturbance except during machinery operation as the site is within the Kakadu Beach development.	
			Australian Darter	1.2	3	91	Type 1		
			Australian Pelican	7.4	40	144			
			Australian White Ibis	5.7	102	144	An area of dredge spoil that has become an artificial roost. The site was lost in 2002 when the Kakadu Beach development completed		
			Bar-tailed Godwit	774.7	3800	143	11	the canal in the area of the roost. However, subsequent dredging has created new roosting habitat that the birds have started to use again. Site is important during spring high tides. As development continues it is to be expected that the site will become unattractive to shorebirds.	
			Beach Thick-knee	1.2	2	15	4		
			Black Swan	2	2	4	24	Kakadu Beach	
			Black-fronted Dotterel	2.1	5	24	5	development completed	disturbance will increase as the development nears completion in the near future.
			Black-necked Stork	1	1	5	4		
			Black-shouldered Kite	1.3	4	11	7		
			Black-tailed Godwit	13.7	40	7	183		
			Black-winged Stilt	14.4	54	54	43		
			Brahminy Kite	1.3	3	33	190		
			Broad-billed Sandpiper	1.9	5	33	142		
			Caspian Tern	13.4	70	71	20		
			Chestnut Teal	10.1	71	3	2		
			Common Sandpiper	1.5	3	5	51		
Common Tern	3.0	5	50	150					
Crested Tern	4.8	50	260	52					
Curlew Sandpiper	35.7	260	32	211					
Double-banded Plover	16.8	32	980	133					
Eastern Curlew	291.1	980	4	56					
Great Egret	1.6	4	550	96					
Great Knot	127.1	550	160	70					
Greater Sand Plover	17.7	160	70	82					
Common Greenshank	12.9	70	82						

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Grey Plover	1.0	1	14		
			Grey-tailed Tattler	17.4	100	17		
			Gull-billed Tern	30.0	200	189		
			Intermediate Egret	1.0	2	23		
			Latham's Snipe	1.0	1	1		
			Lesser Sand Plover	100.7	382	139		
			Little Black Cormorant	3.9	80	86		
			Little Egret	1.4	5	110		
			Little Pied Cormorant	1.7	10	119		
			Little Tern	30.1	160	52		
			Maned Duck	8.1	78	85		
			Marsh Sandpiper	1.9	10	16		
			Masked Lapwing	5.2	25	201		
			Osprey	1.3	7	86		
			Pacific Black Duck	7.3	38	151		
			Pacific Golden Plover	15.4	162	60		
			Pied Cormorant	1.6	5	37		
			Pied Oystercatcher	13.1	63	213		
			Red Knot	5.3	20	10		
			Red-capped Plover	21.1	134	184		
			Red-kneed Dotterel	2.1	6	34		
			Red-necked Avocet	9.4	34	23		
			Red-necked Stint	56.6	330	149		
			Royal Spoonbill	2.7	10	58		
			Ruddy Turnstone	3.2	12	17		
			Sharp-tailed Sandpiper	28.7	200	146		
			Silver Gull	23.3	360	155		
			Sooty Oystercatcher	2.6	8	75		
			Straw-necked Ibis	4.4	17	21		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
17	Sandstone Point	SAPT	Striated Heron	1.1	3	65		
			Terek Sandpiper	5.4	28	9		
			Whimbrel	13.8	120	149		
			Whistling Kite	2.3	8	154		
			White-bellied Sea-Eagle	1.25	3	12		
			White-faced Heron	2.2	13	126		
			Australian Pelican	10.9	80	20	Habitat code: TECSM	Disturbance by people and pets occurs regularly and may have contributed to the decline in shorebirds using the site.
			Australian White Ibis	9	15	11	Type 1	
			Bar-tailed Godwit	63.9	300	59		
			Beach Thick-knee	1.8	2	19	An open beach roost and rock platform but lacks adequate habitat for birds at higher tides. Use by large numbers of birds is intermittent. Last counted in October 2002 and locals have suggested that the numbers of birds using the site have declined dramatically in recent times.	
			Black Swan	3	3	1		
			Black-tailed Godwit	40	40	1		
			Black-winged Stilt	22.3	130	25		
			Brahminy Kite	1.3	2	10		
			Bush Thick-knee	2	2	1		
			Caspian Tern	4.7	13	36		
			Chestnut Teal	4	4	1		
Crested Tern	4.2	17	18					
Curlew Sandpiper	10.7	45	18					
Double-banded Plover	5.75	8	4					
Eastern Curlew	6.2	22	52					
Great Egret	1.5	2	8					
Great Knot	21.2	110	19					
Greater Sand Plover	19.7	56	6					
Common Greenshank	2.2	10	36					
Grey-tailed Tattler	69.9	367	72					
Gull-billed Tern	3.1	8	15					
Lesser Sand Plover	8.25	14	4					
Little Black Cormorant	14	40	4					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Little Egret	2.25	7	8		
			Little Pied Cormorant	10.1	54	16		
			Little Tern	7	12	2		
			Masked Lapwing	3	10	16		
			Osprey	1	1	3		
			Pacific Black Duck	2	2	1		
			Pied Cormorant	16	20	5		
			Pied Oystercatcher	5	20	65		
			Red Knot	5.3	8	3		
			Red-necked Stint	70	138	2		
			Royal Spoonbill	10.75	30	4		
			Ruddy Turnstone	5	14	41		
			Sharp-tailed Sandpiper	5	8	2		
			Silver Gull	3.8	10	16		
			Sooty Oystercatcher	2.2	4	5		
			Straw-necked Ibis	1	1	1		
			Terek Sandpiper	2.25	3	4		
			Whimbrel	29.9	100	65		
			Whistling Kite	1.4	2	32		
			White-bellied Sea-Eagle	1.2	2	5		
			White-faced Heron	5.9	18	28		
18	Buckley's Hole, Bribie Is	BUCK	Australian Pelican	1	1	1	Habitat code: LFSM	Public access to the lagoon is limited by surrounding
			Australian White Ibis	4	10	4	Type 1	vegetation and so disturbance is negligible.
			Bar-tailed Godwit	313.5	600	2		
			Black Swan	2	2	2		
			Black-fronted Dotterel	3	3	1		
			Black-winged Stilt	54.8	162	5		
			Brahminy Kite	2	2	1		
			Caspian Tern	14.75	36	4		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Chestnut Teal	19.5	38	2	shorebirds. The	
			Common Tern	2	2	1	attractiveness of the site	
			Crested Tern	48	88	2	varies with water level in	
			Curlew Sandpiper	21	40	2	the lagoon and the	
			Eastern Curlew	1	1	1	amount of disturbance on	
			Great Egret	1.5	2	2	the nearby Buckley's	
			Great Knot	88	100	2	Hole sandspit (BHBI).	
			Greater Sand Plover	37.5	60	2		
			Grey-tailed Tattler	2	2	1		
			Gull-billed Tern	1.7	2	3		
			Intermediate Egret	3	3	1		
			Latham's Snipe	6	6	1		
			Lesser Sand Plover	81	81	1		
			Little Tern	47	47	1		
			Maned Duck	8	8	1		
			Marsh Sandpiper	1	1	2		
			Masked Lapwing	5	5	1		
			Osprey	1	1	1		
			Pied Oystercatcher	1	1	1		
			Red Knot	5	5	1		
			Red-necked Stint	345	700	4		
			Sharp-tailed Sandpiper	47.7	82	3		
			Silver Gull	30.5	93	4		
			Swamp Harrier	1	1	1		
			Wandering Whistling Duck	6	6	1		
			Whistling Kite	1.25	2	4		
			White-bellied Sea-Eagle	1	1	1		
			White-faced Heron	2	2	1		
19	Buckley's Hole sandbar,	BHBI	Australian Darter	1	1	1	Habitat code: TECS	A heavily disturbed

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
	Bribie Is		Australian Pelican	4.5	18	20	Type 1	site where beach users and fishers regularly ignore
			Australian White Ibis	2.7	6	14		EPA Marine Parks signs identifying the site as a shorebird roost. Birds continue to use site despite disturbance as there are no alternative roosts nearby.
			Bar-tailed Godwit	196.9	700	46	A beach sandspit on the southeastern corner of Bribie Is seaward of the Buckley's Hole lagoon.	
			Beach Thick-knee	2	2	1		
			Black-fronted Dotterel	1	1	1		
			Black-tailed Godwit	10.9	32	7		
			Black-winged Stilt	11.9	50	15	A critical king tide roost that is available on all tides.	
			Brahminy Kite	1	1	4		
			Broad-billed Sandpiper	2	2	1		
			Caspian Tern	4.5	18	20		
			Common Tern	2.7	6	14		
			Crested Tern	196.9	700	46		
			Curlew Sandpiper	62.2	252	27		
			Eastern Curlew	1.2	3	12		
			Great Egret	1.0	1	4		
			Great Knot	76.9	267	29		
			Greater Sand Plover	46.0	250	28		
			Grey-tailed Tattler	2	2	1		
			Gull-billed Tern	8.2	44	19		
			Lesser Crested Tern	4.2	8	6		
			Lesser Sand Plover	67.9	200	15		
			Little Black Cormorant	1.5	3	6		
			Little Egret	1.0	1	1		
			Little Pied Cormorant	3.1	16	18		
			Little Tern	91.2	408	26		
			Masked Lapwing	2.0	3	6		
			Osprey	1.3	3	10		
			Pied Cormorant	2.3	10	18		
			Pied Oystercatcher	14.7	56	20		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
20	Godwin Beach	GOBC	Red Knot	9.0	20	7		
			Red-capped Plover	4.1	12	18		
			Red-necked Stint	131.5	600	32		
			Ruddy Turnstone	2.7	6	3		
			Sanderling	1	1	2		
			Sharp-tailed Sandpiper	17	30	4		
			Silver Gull	25.3	86	46		
			Sooty Oystercatcher	1	1	1		
			Straw-necked Ibis	2	3	2		
			Terek Sandpiper	1	1	1		
			Whimbrel	1.5	2	8		
			Whistling Kite	1.2	2	25		
			White-bellied Sea-Eagle	1.3	2	3		
			White-faced Heron	1.4	4	14		
			White-fronted Tern	1.5	2	2		
			Australian Pelican	16	16	1	Habitat code: TECSM	Likely high disturbance from walkers, pets and possibly vehicles.
			Bar-tailed Godwit	88	214	3	Type 2	
			Black-tailed Godwit	4	4	1		
			Black-winged Stilt	20	20	1	Small sandspit roost	
			Caspian Tern	3	3	1	available to birds on neap	
Crested Tern	2	2	2	high tides and as a staging				
Curlew Sandpiper	50	50	1	roost. Adjoins grassed				
Eastern Curlew	5.5	10	2	esplanade of Godwin				
Great Knot	12	12	1	Beach, with housing				
Common Greenshank	9	15	2	opposite. Situated next to				
Grey-tailed Tattler	10	10	1	extensive feeding				
Little Pied Cormorant	4	4	1					
Red Knot	6	6	1					
Sharp-tailed Sandpiper	15	15	1					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Silver Gull	1	1	1		
			Terek Sandpiper	10	10	1		
			Whistling Kite	1	1	1		
			White-faced Heron	2	2	1		
			Australian Darter	1.1	2	10	Habitat code: TECM	Severe damage to saltmarsh through regular vehicle usage by recreational fishers. Popular spot for fishers who walk through the claypan to the creek. Dogs, walkers and vehicles are a continual threat to birds. This site is in urgent need of government management as bird use has declined dramatically..
21	Caboolture River mouth	CABO	Australian Pelican	13.6	49	134	Type 1	
			Australian White Ibis	4.3	28	83		
			Bar-tailed Godwit	127.8	592	112	Medium-sized claypan	
			Black Swan	2	2	2	with fringing mangroves, road access and boat ramp. Bounded on north by Caboolture River and on the southern side by Burpengary Creek	
			Black-fronted Dotterel	3.5	12	11		
			Black-tailed Godwit	184	400	4		
			Black-winged Stilt	16.5	54	50		
			Brahminy Kite	1.3	3	86		
			Broad-billed Sandpiper	2.6	4	5		
			Caspian Tern	12.0	72	130		
			Chestnut Teal	2.8	12	20		
			Common Sandpiper	1.4	2	8		
			Common Tern	6.3	12	3		
			Crested Tern	5.3	42	85		
			Curlew Sandpiper	22.6	200	54		
			Double-banded Plover	15.4	105	27		
			Eastern Curlew	24.9	192	120		
			Great Egret	1.3	4	50		
			Great Knot	49.4	250	68		
			Greater Sand Plover	7.0	50	64		
			Common Greenshank	7.7	60	30		
			Grey-tailed Tattler	21.1	80	9		
			Gull-billed Tern	10.3	35	99		
			Intermediate Egret	1	1	4		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Lesser Crested Tern	1.5	2	2		
			Lesser Sand Plover	117.6	570	103		
			Little Black Cormorant	12.7	30	13		
			Little Egret	1.3	6	61		
			Little Pied Cormorant	1.3	2	6		
			Little Tern	22	22	1		
			Maned Duck	4	4	1		
			Marsh Sandpiper	22	22	1		
			Masked Lapwing	2	6	51		
			Osprey	1.2	5	36		
			Pacific Black Duck	1.8	2	5		
			Pacific Golden Plover	24.2	115	41		
			Pied Cormorant	1.6	3	12		
			Pied Oystercatcher	16.8	90	77		
			Red Knot	11.4	30	7		
			Red-capped Plover	12.8	70	123		
			Red-necked Stint	116.9	600	100		
			Royal Spoonbill	2	4	3		
			Ruddy Turnstone	1.5	3	6		
			Sanderling	6	6	1		
			Sharp-tailed Sandpiper	4.4	19	14		
			Silver Gull	34.2	300	130		
			Straw-necked Ibis	1.5	4	16		
			Striated Heron	1	1	6		
			Terek Sandpiper	6.6	35	9		
			Whimbrel	24.8	138	124		
			Whistling Kite	1.3	4	86		
			White-bellied Sea-Eagle	1.2	3	60		
			White-faced Heron	1.3	4	42		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
22	Deception Bay claypan	DBBA	White-winged Black Tern	75	75	1	Habitat code: TECM	Regular disturbance from people
			Australian Darter	1	1	1	Type 1	walking and riding motorbikes and bicycles across the site to Burpengary Ck.
			Australian Pelican	1.6	3	5		
			Australian White Ibis	11.3	67	107		
			Bar-tailed Godwit	92.5	438	51	A critical king high tide roost that provides a roost for shorebirds from adjacent roosts (CABO, DBMN and DBFR) on extreme high tides. Vast claypan and saltmarsh with interconnecting roosting areas. Fringed by mangroves on eastern side and housing on the west.	
			Black-fronted Dotterel	14	37	29		
			Black-necked Stork	1	1	1		
			Black-tailed Godwit	76	105	3		
			Black-winged Stilt	3.6	11	5		
			Brahminy Kite	4.5	47	15		
			Broad-billed Sandpiper	3.3	6	3		
			Caspian Tern	24.0	400	44		
			Chestnut Teal	3.7	32	22		
			Curlew Sandpiper	16.5	84	13		
			Double-banded Plover	6.7	33	6		
			Eastern Curlew	56.8	206	76		
			Great Egret	1.4	3	20		
			Great Knot	32.4	124	17		
			Greater Sand Plover	1.0	1	1		
			Common Greenshank	1.5	3	11		
			Gull-billed Tern	7.1	23	29		
			Intermediate Egret	1.3	3	9		
			Latham's Snipe	1.2	2	5		
			Lesser Sand Plover	89.4	358	21		
			Little Black Cormorant	1.0	1	1		
			Little Egret	1.4	6	27		
			Little Pied Cormorant	1	1	1		
			Little Tern	8	8	1		
			Maned Duck	4	7	2		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Masked Lapwing	2.9	7	40		
			Osprey	1.4	2	7		
			Pacific Black Duck	1.8	4	6		
			Pacific Golden Plover	34.6	94	47		
			Pied Oystercatcher	15.0	65	16		
			Red Knot	15.8	33	5		
			Red-capped Plover	15.9	116	83		
			Red-kneed Dotterel	1.3	2	3		
			Red-necked Stint	162.5	946	52		
			Royal Spoonbill	1.1	2	8		
			Ruddy Turnstone	1	1	1		
			Sharp-tailed Sandpiper	10.7	55	26		
			Straw-necked Ibis	2.8	15	47		
			Striated Heron	1	1	1		
			Terek Sandpiper	1.5	2	2		
			Whimbrel	32.4	114	69		
			Whistling Kite	1.7	10	33		
			White-bellied Sea-Eagle	1.2	2	10		
			White-faced Heron	2.6	11	102		
			White-necked Heron	5	5	1		
			White-winged Black Tern	7	7	1		
23	Deception Bay central (DPI)	DBFR	Australian Pelican	3.9	7	7	Habitat code: TECMR	All the threats of intense human habitation are present at this roost:
			Australian White Ibis	3.6	25	11	Type 2/3	dogs, cats, people use the site almost daily.
			Bar-tailed Godwit	17.7	59	12		
			Black-tailed Godwit	26	50	2	Mangrove roost on shore	
			Black-winged Stilt	33.9	79	17	of bay beside boat ramp	
			Brahminy Kite	1.3	2	12	of Qld DPIF Research	
			Caspian Tern	1.1	2	8	Station. Coffee rock shelf	
			Curlew Sandpiper	10	30	4	used by birds on neap	

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Eastern Curlew	20.9	50	10	tides.	
			Great Egret	1	1	4		
			Great Knot	45.8	100	5		
			Common Greenshank	1.8	4	5		
			Grey-tailed Tattler	60.6	285	34		
			Gull-billed Tern	2.7	3	3		
			Little Egret	1	1	3		
			Little Pied Cormorant	1	1	1		
			Masked Lapwing	1.8	3	5		
			Osprey	1	1	5		
			Pied Cormorant	3	3	1		
			Pied Oystercatcher	27	27	1		
			Ruddy Turnstone	2.3	3	3		
			Sharp-tailed Sandpiper	1.5	2	2		
			Silver Gull	10.8	24	4		
			Striated Heron	1	1	2		
			Terek Sandpiper	10.2	46	25		
			Whimbrel	17.6	100	17		
			Whistling Kite	1	1	3		
			White-bellied Sea-Eagle	1	1	1		
			White-faced Heron	1.3	3	13		
24	Deception Bay south	DBMN	Australian Darter	1	1	2	Habitat code: TECM	The staging roost is highly disturbed by people and dogs, but the lagoon is probably not greatly disturbed by humans or pets and has limited threats
			Australian Pelican	1.2	2	15	Type 1	
			Australian White Ibis	3.3	26	108		
			Bar-tailed Godwit	108.6	555	144	Vast mangrove-fringed wetland extending into Redcliffe Peninsula. A large tidally inundated lagoon that is fringed by	
			Beach Thick-knee	1	1	1		
			Black-fronted Dotterel	2	2	1		
			Black-necked Stork	2	2	1		
			Black-tailed Godwit	70.7	506	94		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Black-winged Stilt	129.4	1132	154	mangroves and some	to shorebirds.
			Brahminy Kite	1.2	2	24	<i>Casuarina</i> on the	
			Caspian Tern	1.0	1	1	landward side. Site is	
			Chestnut Teal	21.5	240	134	part of a designated Fish	
			Common Greenshank	19.8	76	113	Habitat Reserve. Roost	
			Crested Tern	1.0	1	1	used by a large range of	
			Curlew Sandpiper	51.0	409	96	shorebirds and waterbirds	
			Eastern Curlew	3.3	32	39	on most neap and	
			Great Egret	2.5	16	45	moderate high tides (up to	
			Great Knot	24.1	142	76	2.3 m). The site also	
			Grey Teal	2	2	1	includes a small staging	
			Grey-tailed Tattler	35	212	63	roost on northern adjacent	
			Gull-billed Tern	3.7	9	3	beach that supports	
			Intermediate Egret	1.5	7	16	shorebirds on neap tides.	
			Little Black Cormorant	10.2	50	6	Mangrove forest adjoins	
			Little Egret	2.4	18	75	esplanade of suburban	
			Little Pied Cormorant	1.0	1	3	area.	
			Marsh Sandpiper	25.9	245	69		
			Masked Lapwing	3.7	25	47		
			Osprey	1.3	3	7		
			Pacific Black Duck	2.5	5	4		
			Pacific Golden Plover	2	2	1		
			Pied Cormorant	2	2	1		
			Red Knot	30.4	143	32		
			Red-capped Plover	12.0	12	1		
			Red-kneed Dotterel	2.7	6	3		
			Red-necked Avocet	112.0	646	92		
			Red-necked Stint	17.0	40	5		
			Royal Spoonbill	4.7	16	34		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
25	Redcliffe Airport Northside	RANS	Sharp-tailed Sandpiper	21.1	120	26		
			Silver Gull	13.2	42	12		
			Straw-necked Ibis	4.2	8	6		
			Striated Heron	1	1	5		
			Terek Sandpiper	1.5	4	8		
			Whimbrel	25.0	120	157		
			Whistling Kite	1.2	4	49		
			White-bellied Sea-Eagle	1.0	2	21		
			White-faced Heron	2.4	19	118		
			Black-winged Stilt	5	5	1	Habitat code: TECM	Tenure of site fairly secure while
			Brahminy Kite	1	1	1	Type 1	Redcliffe airport
			Caspian Tern	34	61	2		continues to operate.
			Chestnut Teal	10	10	1		Access to roost is only through airport
			Eastern Curlew	8	9	2		and thus is heavily restricted. This would be one of the least threatened sites in MBRC
			Great Egret	1	1	1		jurisdiction.
			Intermediate Egret	4	4	2		
			Masked Lapwing	2.5	3	2		
Osprey	2	2	2					
Pacific Black Duck	12	12	1					
Pied Oystercatcher	3	3	1					
Red-capped Plover	15.5	16	2					
Red-necked Stint	1199.5	1742	2					
Sharp-tailed Sandpiper	76.5	91	2					
Silver Gull	3.5	5	2					
Black-winged Stilt	50	50	1	Habitat code: LFM Type	Site threatened by potential housing development and reductions of local runoff from			
Curlew Sandpiper	3	3	1	1				
Japanese Snipe	30	30	1					
Marsh Sandpiper	10	10	1					
Red-kneed Dotterel	15	15	1					

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Sharp-tailed Sandpiper Wood Sandpiper	50	50	1	However, in periods of above-average rainfall, provides suitable roosting and feeding habitat for migratory shorebirds that prefer freshwater wetlands.	conversion of the catchment to urban development. This has the effect of reducing the periods when the site is inundated and thus suitable for shorebirds.
27	Clontarf West	CTFW	Black-fronted Dotterel Black-winged Stilt Chestnut Teal Eastern Curlew Masked Lapwing Red-capped Plover Red-necked Stint White-faced Heron	1 10 1 25 13 5.5 4 5 1	1 10 1 25 13 9 4 5 1	1 1 1 1 2 1 1 1	Habitat code: TECM Type 1 A large claypan in the upper section of Hays Inlet. Site would have been important to shorebirds in the past when the water quality and habitats in Hays Inlet supported more shorebirds. Would provide king tide roost habitats for birds if needed.	Low shorebird usage of site unrelated to threats. Site potentially under threat of future urban expansion. Motorbike tracks widely dispersed across mudflats suggest regular activity that may disturb shorebirds.
28	Pine Rivers north	PRNS	Australasian Shoveller Australian Darter Australasian Pelican Australasian White Ibis Bar-tailed Godwit Black Swan	2 1 3 11.9 162.4 2	2 1 8 41 840 2	1 1 15 123 97 1	Habitat code: TECM Type 1 A large claypan east of the motorway on the	Few threats as public access is restricted by property owner of access track west of claypan.

Moreton Bay Regional Council shorebird roost habitat mapping project

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Black-fronted Dotterel	3.6	6	3	north side of the North Pine River. The critical	
			Black-tailed Godwit	121.3	404	114	roost in the region that is used by almost all the shorebirds feeding in Bramble Bay and Hays Inlet.	
			Black-winged Stilt	82.7	337	136		
			Brahminy Kite	1.1	2	23		
			Caspian Tern	4.1	20	18		
			Cattle Egret	2	2	1		
			Chestnut Teal	56.2	342	120		
			Common Greenshank	19	68	115		
			Curlew Sandpiper	64.2	325	70		
			Eastern Curlew	28.3	160	86		
			Great Egret	1.7	7	68		
			Great Knot	38.4	171	40		
			Grey Teal	16.8	154	16		
			Grey-tailed Tattler	6	6	1		
			Gull-billed Tern	8.4	35	53		
			Intermediate Egret	2	5	12		
			Latham's Snipe	1	1	1		
			Little Black Cormorant	15	64	5		
			Little Egret	2.3	7	32		
			Little Pied Cormorant	1.8	5	17		
			Little Tern	6	6	1		
			Maned Duck	11.9	52	30		
			Marsh Sandpiper	8.3	74	89		
			Masked Lapwing	6.9	34	137		
			Osprey	1.1	2	18		
			Pacific Black Duck	16.8	164	32		
			Pacific Golden Plover	26.2	97	24		
			Peregrine Falcon	1	1	2		
			Pied Cormorant	5	8	2		

Site No	QWSG Roost Name	QWSG Roost Code	English Name	Average number of birds	Max No. of birds	No. of counts	Roost Characteristics	Threats
			Pied Oystercatcher	1.7	2	3		
			Red Knot	17	71	25		
			Red-capped Plover	10.3	63	55		
			Red-kneed Dotterel	10.2	57	65		
			Red-necked Avocet	28.4	103	19		
			Red-necked Stint	10.9	53	15		
			Royal Spoonbill	2.7	8	34		
			Sharp-tailed Sandpiper	76.4	640	98		
			Silver Gull	7.9	53	24		
			Straw-necked Ibis	4.2	34	59		
			Striated Heron	1	1	1		
			Terek Sandpiper	4	4	1		
			Whimbrel	37.8	128	111		
			Whiskered Tern	1	1	1		
			Whistling Kite	1.5	21	53		
			White-bellied Sea-eagle	1.4	3	16		
			White-faced Heron	5.1	20	121		

3.2.3 Roost mapping survey limitations

This report is the result of two independent surveys of different parts of the coastal areas of the MBRC. These surveys were undertaken by the same people, but were made in separate years (January-February 2008 and April 2009). The interim report (Milton and Dening 2008) submitted to the then Caboolture Shire Council has been updated for this report to include roosts in the former North Pine Shire and Redcliffe City Council areas. These areas are in the southern part of the new MBRC jurisdiction. The timing of the surveys of the southern MBRC area in April 2009 was not ideal as most migratory shorebirds had left for their breeding grounds before the survey could be completed. Areas of potentially suitable habitat in the southern MBRC jurisdiction are difficult to access as the adjacent area is privately-owned freehold land. Additional surveys of these regions during the austral summer (2009/10) would be desirable to ensure all roosting habitats within the MBRC boundaries have been identified, mapped and incorporated into the MBRC GIS. The QWSG has a comprehensive knowledge of shorebird distribution in Moreton Bay. It is unlikely that additional surveys of these potential roost sites will identify new roosts used by many shorebirds (>50). However, the distribution of shorebirds is dynamic and roost use patterns change over time in response to changes in food and disturbance. Thus, completion of the surveys of these potential roosts is recommended to ensure the MBRC have the most comprehensive data available.

3.2.4 Putting MBRC shorebird roosts in a regional context

The MBRC has a large number of important shorebird roosts that support a large diversity of species of shorebird and other waterbirds (Table 3.3). Shorebird use of coastal areas in the rest of Moreton Bay is more constrained as much of the original sub-coastal habitats have been urbanised. The coastal areas to the north of the MBRC in the Sunshine Coast Regional Council jurisdiction have less suitable shorebird feeding habitat as the coast is more exposed to wave action and river estuaries are small and provide little feeding or roosting habitat. To the south, a single stormwater runoff event greatly reduced the densities of intertidal invertebrates on Nudgee Beach in 1997 (S. Quinnell, Griffith Univ. unpubl. data). The densities of shorebirds feeding in this area were high before this event (Thompson 1990) and have not subsequently recovered. Improvements in the quality of sewerage effluent from the Luggage Pt treatment plant have also reduced the densities of intertidal invertebrates around the mouth of the Brisbane River. At the same time, the Port of Brisbane Authority have undertaken a massive expansion and reclaimed several square kilometres of intertidal areas that were prime shorebird feeding habitat. This reclamation has provided artificial roosting and feeding habitats for the large number of shorebirds that occur in the area. QWSG surveys of the POB reclamation site have counted up to 13,000 shorebirds and waterbirds during summer. However, when the reclamation is complete, these habitats will be lost and these shorebirds will need to redistribute elsewhere in Moreton Bay or further afield. Elsewhere in the Brisbane City Council jurisdiction, only southern Moreton Is and the Manly-Lytton area hold substantial numbers of shorebirds similar to those in the MBRC. Thus, the MBRC region contains the least impacted parts of Moreton Bay with substantial quantities of shorebird feeding and roosting habitat. The area under MBRC jurisdiction supports over half the shorebirds in Moreton Bay and thus MBRC is in a unique position to play an important role in maintaining their habitats for the future.

Recent analysis of the QWSG count data has shown that seven species have declined dramatically in Moreton Bay since QWSG began in 1992 (Fuller et al. 2009). These species were all the larger shorebird species and most susceptible to changes in habitats in Moreton Bay and at staging sites between the breeding grounds and Australia. Most had declined by about 50% since 1992. Changes in the quality and quantity of shorebird habitats in Moreton Bay have contributed to these declines.

The study also looked at disturbance recorded by QWSG counters during monthly counts on the weekend spring high tides. It showed that two roosts in MBRC region had the highest level of disturbance of any roosts in Moreton Bay. These roosts (Buckley's Hole sandspit and Kakadu Beach) are both on Bribie Is, a popular tourist destination. MBRC needs to take appropriate steps to minimise human impacts on shorebirds. By inclusion of these shorebird high tide roosts within the MBRC planning provisions and following the guidelines outlined in the factsheet (Appendix E), Council will be making important steps towards reducing impacts and the decline in shorebirds in Moreton Bay.

4. REFERENCES

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APPENDIX A – GLOSSARY OF TECHNICAL TERMS

Artificial roost – Man-made roost developed to replace natural high tide roosts lost due to coastal development. **Not recommended** as a sustainable option for replacing lost natural roosts as they require on-going maintenance and management to ensure their viability. Moreton Bay Regional Council has two artificial roosts – Toorbul and Kakadu Beach and both require regular maintenance by Council to remove vegetation growth that covers each site if left alone.

EPBC Act – The federal Environmental Protection and Biodiversity Conservation Act 1999 – identifies matters of national environmental significance.

High tide roost – An open area usually above high water where shorebirds rest and digest their food while waiting for the tide to recede to allow them to return to feeding (see Appendix C for details). Some species roost in trees (roost Type 3) on some tides. These species rest on horizontal branches of mangrove trees where they have an unobstructed view of their surrounds.

Shorebird – A taxonomically related group of bird species that includes both resident and migratory species. Migratory species breed in the higher latitudes of the northern hemisphere from northern China north to the tundra in Russia and Alaska. Most migratory species feed in coastal intertidal areas on invertebrates. These species are listed under the federal EPBC Act (see Appendix C)

Staging roost – A roost usually on the upper intertidal flats adjacent to shorebird feeding areas. Staging roosts are used by shorebirds when the majority of the intertidal area is covered. As the tide rises further, birds are forced to leave for the main high tide roosts. If the tide does not rise further (such as during neap tidal cycles), birds will stay on these roosts as they are close to the feeding areas.

APPENDIX B – SHOREBIRD SPECIES LIST FOR MORETON BAY

Key to conservation status

V - Species listed as Vulnerable under Queensland's Nature Conservation Act 1992

R - Species listed as Rare under Queensland's Nature Conservation Act 1992

M - Migratory species listed under the EPBC Act

V/c - Species listed as Vulnerable under the EPBC Act

M/r - Listed marine species under the EPBC Act

Family	Common name	Scientific name	Conservation status				
			V	R	M	V/c	M/r
Jacaniidae	Comb-crested jacana	<i>Irediparra gallinacea</i>					
Rostratulidae	Australian painted snipe	<i>Rostratula australis</i>		•	•	•	•
Haematopodidae	South Island pied oystercatcher	<i>Haematopus finschi</i>					
Haematopodidae	Sooty oystercatcher	<i>Haematopus fuliginosus</i>		•			
Haematopodidae	Pied oystercatcher	<i>Haematopus longirostris</i>					
Recurvirostridae	Black-winged stilt	<i>Himantopus himantopus</i>			•		•
Recurvirostridae	Red-necked avocet	<i>Recurvirostra novaehollandiae</i>			•		•
Burhinidae	Bush stone-curlew	<i>Burhinus grallarius</i>					
Burhinidae	Beach stone-curlew	<i>Esacus neglectus</i>	•				•
Glareolidae	Australian pratincole	<i>Stiltia isabella</i>			•		•
Charadriidae	Double-banded plover	<i>Charadrius bicinctus</i>			•		•
Charadriidae	Greater sand plover	<i>Charadrius leschenaultii</i>			•		•
Charadriidae	Lesser sand plover	<i>Charadrius mongolus</i>			•		•
Charadriidae	Red-capped plover	<i>Charadrius ruficapillus</i>					•
Charadriidae	Black-fronted dotterel	<i>Euseyonis melanops</i>					
Charadriidae	Red-kneed dotterel	<i>Erythrogonys cinctus</i>					
Charadriidae	Pacific golden plover	<i>Pluvialis fulva</i>			•		•
Charadriidae	Grey plover	<i>Pluvialis squatarola</i>			•		•
Charadriidae	Masked lapwing	<i>Vanellus miles</i>					
Charadriidae	Banded lapwing	<i>Vanellus tricolor</i>			•		
Scolopacidae	Ruddy turnstone	<i>Arenaria interpres</i>			•		•
Scolopacidae	Sharp-tailed sandpiper	<i>Calidris acuminata</i>			•		•
Scolopacidae	Sanderling	<i>Calidris alba</i>			•		•
Scolopacidae	Red knot	<i>Calidris canutus</i>			•		•
Scolopacidae	Pectoral sandpiper	<i>Calidris melanotos</i>			•		•
Scolopacidae	Curlew sandpiper	<i>Calidris ferruginea</i>			•		•
Scolopacidae	Red-necked stint	<i>Calidris ruficollis</i>			•		•
Scolopacidae	Great knot	<i>Calidris tenuirostris</i>			•		•
Scolopacidae	Latham's snipe	<i>Gallinago hardwickii</i>			•		•
Scolopacidae	Grey-tailed tattler	<i>Heteroscelus brevipes</i>			•		•

Family	Common name	Scientific name	Conservation status				
			V	R	M	V/c	M/r
Scolopacidae	Wandering tattler	<i>Heteroscelus incanus</i>			•		•
Scolopacidae	Broad-billed sandpiper	<i>Limicola falcinellus</i>			•		•
Scolopacidae	Asian dowitcher	<i>Limnodromus semipalmatus</i>			•		•
Scolopacidae	Bar-tailed godwit	<i>Limosa lapponica</i>			•		•
Scolopacidae	Black-tailed godwit	<i>Limosa limosa</i>			•		•
Scolopacidae	Eastern curlew	<i>Numenius madagascariensis</i>		•	•		•
Scolopacidae	Little curlew	<i>Numenius minutus</i>			•		•
Scolopacidae	Whimbrel	<i>Numenius phaeopus</i>			•		•
Scolopacidae	Common sandpiper	<i>Tringa hypoleucos</i>			•		•
Scolopacidae	Common greenshank	<i>Tringa nebularia</i>			•		•
Scolopacidae	Marsh sandpiper	<i>Tringa stagnatilis</i>			•		•
Scolopacidae	Terek sandpiper	<i>Xenus cinereus</i>			•		•

Appendix 1 of EPA Moreton Bay Shorebird Management Strategy (2005)

([//www.epa.qld.gov.au/publications/p01627aa.pdf/Shorebird_management_strategy_Moreton_Bay.pdf](http://www.epa.qld.gov.au/publications/p01627aa.pdf/Shorebird_management_strategy_Moreton_Bay.pdf))

APPENDIX C - INTERNATIONAL AND COMMONWEALTH MECHANISMS FOR SHOREBIRD PROTECTION

Mechanism	Level of Protection	Protection Provided
<i>1971 Ramsar Convention</i>	International	Protects wetlands of international significance under the 'wise use' principle and obliges Australia to "...give particular priority to promoting sustainable restoration..." in respect to Wader habitat. Moreton Bay Ramsar Site 41 is one of 49 sites in Australia.
<i>1974 Japan Australia Migratory Bird Agreement and 1986 China Australia Migratory Bird Agreement</i>	International	Requires parties to protect migratory birds and their environments. Signatories are obliged to conserve and protect migratory birds, particularly endangered species; establish sanctuaries for migratory birds; and "take appropriate measures to preserve and enhance" their environment.
<i>Environmental Protection & Biodiversity Conservation Act 1999</i>	Commonwealth	Sections 16 and 17 protect Ramsar wetlands of Moreton Bay as a matter of National Environmental Significance. The Commonwealth has the power to control or prohibit activities or development that might damage the well being of the birds' habitat.
National Plan for Shorebird Conservation	Commonwealth	Aims to protect shorebird roosting and feeding sites of national significance.

Other statutory and policy mechanisms in place at the State and local level to protect shorebirds and their habitats include:

- *Nature Conservation Act 1992*
- *Environmental Protection Act 1994*
- *Fisheries Act 1994*
- *Coastal Protection and Management Act 1995*
- *Marine Parks Act 1982*
- State Shorebird Management Strategy: Moreton Bay 2005
- Strategy for Conservation and Management of Queensland's Wetlands 1999
- Marine Parks (Moreton Bay) Zoning Plan 1997
- SEQ Regional Plan 2005 - 2026
- SEQ Regional Nature Conservation Strategy
- State and SEQ Coastal Policy
- SEQ NRM Plan
- Local Nature Conservation Strategy or LNCS (Moreton Bay Regional Council, in prep)
- Moreton Bay Regional Council Plan
- Management Plan for Wader High-Tide Roosts in the Central-Southern Pumicestone Passage (2000, Hegira)

APPENDIX D – PUMICESTONE SHOREBIRD MANAGEMENT GROUP (PSMG)

The PSMG is represented by the following organisations:

- Queensland Wader Study Group (QWSG);
- Moreton Bay Regional Council (MBRC);
- Sunshine Coast Regional Council (SCRC);
- Queensland Parks and Wildlife Service (QPWS);
- Bribie Island Environmental Protection Association (BIEPA);
- Pumicestone Region Catchment Coordination Association Inc. (PRCCA);
- QM Properties Pty Ltd; and
- HLA-Envirosciences Ltd.

APPENDIX E – SHOREBIRD FACTSHEET AND PLANNING GUIDELINES

Local government shorebird factsheet and guidelines for planners (use with shorebird GIS)

What are shorebirds ?

Shorebirds or waders are a diverse group of birds from the taxonomic order Charadriiformes and include plovers, sandpipers, stints, curlews, knots, snipes, godwits, avocets, stilts, oystercatchers, pratincoles, lapwings and several other odd species. They range in shape and size from the tiny Red-necked Stint (30 g) to the largest species, Eastern Curlew, at 1.3 kg. Their bills vary greatly in length and shape among the species groups, depending on their prey and habitats they use.



Terek Sandpipers roosting on a typical type 3 roost (Photo: Ian Sutton)

Shorebirds can be classified into two main groups – migratory or resident. The migratory species make spectacularly long annual flights to reach their breeding grounds in northern Russia, Mongolia and China. Because migratory waders are shared between a many countries there are international agreements that identify and promote the protection of these birds.

Where do they live ?

Within Caboolture Shire Council jurisdiction, the majority of shorebirds, and all migratory species, live on the coast and feed in the intertidal area. Their lives are governed by the tides not by the sun and so when the tides are low, they will be feeding, both day and night. At high tide, the feeding habitats are covered; they need to rest to digest their food and sleep. In order to do this, they need a suitable “roosting” site – near

their feeding ground, safe from predators (disturbance) and of a habitat that enables them to maintain their preferred body temperatures.

These roost sites are usually open areas above high tide (claypans, saltmarshes, sandbars, spits) where they can see predators easily. Tides vary during the lunar cycle and seasonally and so shorebirds take advantage of this to use different roost sites depending on the tide height.

There are three main types of roost site:

Type 1 – ground sites that cater for most species on most tides (saltmarshes, claypans or high level sandpits). Most common type of roost used by shorebirds (especially at spring tides)

Type 2 – sites that serve as roosts on lower high tides or function as a staging roost during incoming and outgoing tides as they move on and off the feeding grounds.

Type 3 – tree roosts used by a selection of species that move into trees (mostly old mangroves) behind a type 2 roost as the tide rises. These roosts are often close to larger type 1 ground roosts of other shorebird species.

Migratory shorebirds are predominantly in the GSS in the summer months and its where they spend the non-breeding season (September-April).

At the end of the non-breeding season (March/April), as they prepare to migrate to the Arctic, shorebirds feed continuously to build up fat reserves that they use during the long flights. Disturbance to shorebirds at this time can have a significant adverse effect on their ability to complete this flight and breed.

Major management issues and suggested guidelines

Shorebirds roosts are often in estuaries where there are already many important reasons why they should be kept free of development. Maintaining viable shorebird roosts needs to be seen as part of the overall protection of a wetland system (with both tidal and fresh water components). A

viable roost should not be disturbed by human activity. Therefore the roost needs to be managed in the context of the surrounding wetlands. The buffer distances required for the roost will vary with the land use in the buffer. For example, people can walk within 50m of roosting birds without disturbing them. However, this will only occur when it's in a managed way – such as only along a set path clearly separated from the roost, (which may be fenced or separated by water).

When new residential subdivisions are being considered in the vicinity of shorebird roosts, the intent should be to allow the shorebirds flexibility in how and when they use the roost. For instance the birds will have different requirements in different seasons, tides and weather conditions. Therefore it is important to maintain a variety of habitats in a wetland. A recommended buffer is to ensure that assessable development is 200m from the highest astronomical tide.



Example of 200m buffer (blue line) around boundary of a wetland containing high tide shorebird roost (red line) at Deception Bay.

Such residential subdivisions should only be considered after establishing options to secure existing roost sites. To obtain approval for the development, developers need to make tradeoffs that provide protection of wetlands, including the shorebird roosts.

The other important area for shorebirds beside their roost sites is the intertidal areas where they feed when the tide is out. While shorebirds do concentrate their feeding in productive mudflats in the mouths of estuaries, these areas are most often subject to water pollution from storm water runoff and sewerage outlets. In areas of dense

development, retention basins are needed to reduce high flows to marine areas.

Other threats in the CSC jurisdiction include damage of freshwater wetlands by feral pigs, changes to roosts from increased mangrove growth, invasion of wetlands by weeds such as groundsel. Feral foxes and cats prey on breeding shorebirds and migratory species at high tide roosts.

If the known shorebird roosts (identified in the GIS) are kept viable and free from disturbance, they should ensure that shorebirds have sufficient area to maintain their populations in Pumicestone Passage.

The on-going management of roosts will often require cooperation between agencies. These agencies may include the QPWS and/or the Department of Natural Resources and Mines, depending on the tenure of the area. By taking a cooperative approach, the most effective management option can be identified for each roost. This approach will usually be on a case-by-case basis.

Further information

Qld EPA (2004) Moreton Bay shorebird management strategy

Qld EPA (2005) Draft Great Sandy Marine Park Northern Section Management Plan

Ramsar site description for Moreton Bay (including Pumicestone Passage) (www.wetlands.org/rsis/)

Department of Environment and Heritage directory of important wetlands (www.environment.gov.au/water/publications/environmental/wetlands/pubs/directory-ch8.pdf)

Shorebird brochure (Shorebird Conservation in Australia) insert to Wingspan 12 (4) December 2002.

Qld EPA (2004) Moreton Bay Shorebird Strategy (http://www.epa.qld.gov.au/publications/p01627aa.pdf/Shorebird_management_strategy_Moreton_Bay.pdf)