Port Botany Post Construction Environmental Monitoring

Shorebirds Monitoring Off-Peak Summary Report

August 2012

Prepared for Sydney Ports Corporation
24 January 2012

Avifauna Research & Services Pty. Ltd.

Cardno Shaping the Future

Document Information

Prepared for Sydney Ports Corporation

Project Name Port Botany Expansion – Post Construction Environmental Monitoring

Date 02 January 2013

Document Control

Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
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2	24 Jan 2013	Phil Straw	PJS		

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1 Introduction

1.1 Background

Penrhyn Estuary is the most important feeding and roosting area for migratory and non-migratory shorebirds on the northern side of Botany Bay. The shorebird population at Penrhyn Estuary has shown a decline in the numbers of most shorebird species since regular counts have been made since 2001 (NSW Wader Study Group data). This trend continued during studies by Sydney Ports Corporation from December 2006, when compared with reference sites. Penrhyn Estuary was rehabilitated as part of the Port Botany Expansion Project to enhance the existing intertidal habitat and to expand the estuary as a long-term habitat for migratory shorebirds. Habitat enhancement may result in the return of some birds that previously used the area but are no longer found in the Estuary and in some cases no longer found in Botany Bay. The aim of the shorebird monitoring program is to monitor numbers of shorebirds feeding and roosting on site to determine the success of the habitat enhancement works.

Penrhyn Estuary is considered a significant feeding and roosting site in Botany Bay for seven 'key' species (NSW Wader Study Group Data). Six of these species were selected to measure the success of the Penrhyn Estuary Habitat Enhancement Plan (PEHEP) throughout the pre-construction, construction and post construction phases. These species are: Bar-tailed Godwit, Red-necked Stint, Double-banded Plover, Curlew Sandpiper, Red Knot and Pacific Golden Plover. The seventh key species, the Sharp-tailed Sandpiper, was unsuitable to include for monitoring because of its irregularity in numbers at coastal sites due to the variability of flooding of inland wetlands. The abundance of key species, compared with counts at reference sites, will indicate the success of PEHEP works. No decline in numbers of any of the key species compared with baseline data would indicate that the habitat enhancement has had no negative impacts. Any increase in the numbers of each of these species would be evidence of habitat enhancement success.

1.2 Purpose of this report

This report provides a summary of the data collected for the post-construction off-peak season April 2012-August 2012 as part of the shorebird monitoring works. This report will document the progress of the monitoring performed and provide preliminary discussion, which will identify any important observations during fieldwork and inspection of the raw data collected. A more detailed annual report (to be submitted in April 2013 following the next peak season) will analyse changes to shorebird populations over time by comparing post-construction counts with those from pre-construction and construction phases.

2 Monitoring Methodology

Fortnightly surveys of shorebirds were carried out at low and high tide at the study site, Penrhyn Estuary, and at selected reference sites from the start of April 2012 to the end of August 2012. In addition, one low and high tide nocturnal survey is conducted each month at Penrhyn Estuary to determine any differences in use of the site between diurnal and nocturnal periods. Where possible, local reference sites were chosen to ensure accuracy of data collection, with sites being surveyed on the same day by the same team of shorebird experts. However, as sites around Botany Bay did not support sufficient numbers of some species for analysis, some regional sites were selected outside of the Bay for these species (Table 1 and Appendix A).

Table 1 Key species monitored and associated reference sites

Area	Sites	Habitats	Key species
Penrhyn Estuary		Tidal estuarine mudflats Tidal sand flats Sand spits Sandy beaches Stony substrate Sand islands	Bar-tailed Godwit Red-necked Stint Pacific Golden Plover Red Knot Curlew Sandpiper Double-banded Plover
Southern Botany Bay	Quibray Bay	Tidal sand flats Sandy beaches Oyster lease structures	Bar-tailed Godwit
	Riverside Drive	Tidal estuarine mudflats Tidal sand flats Sand spit Sandy beaches	
	Woodlands Road	Tidal estuary mudflats Tidal sand flats Sandy beaches	
Parramatta Estuary	Hen and Chicken Bay	Tidal estuarine mudflats Tidal sand flats Sandy beaches Sand/rock spits Concrete jetty	Curlew Sandpiper
	Mason Park & Waterbird Refuge	Saltmarsh and lagoons	
Boat Harbour		Tidal rock platform Tidal sand flats Sandy beaches	Red-necked Stint Double-banded Plover
Hunter River Estuary		Tidal estuarine mudflats Tidal sand flats Sandy beaches Rocky shores	Pacific Golden Plover

2.1 Study Site

Penrhyn Estuary is a small estuary created incidentally during the construction of Port Botany in the 1970's. Silts and nutrients enter the estuary via two stormwater channels, Springvale and Floodvale drains, providing suitable substrate for a range of benthic organisms, in turn attracting a variety of migratory and non-migratory shorebirds. The reconfiguration of the estuary including the PEHEP works resulted in enlarged intertidal feeding habitat, three high tide islands which provide secure roosting and nesting sites, as well as the enhancement of saltmarsh areas for shorebird roosting and feeding habitat.

2.2 Reference sites

Southern Botany Bay

Three reference sites were monitored by boat at high tide and on foot at low tide to measure relative abundance compared with Penrhyn Estuary while additional high tide roost sites were counted in order to estimate the total population of Bar-tailed Godwits in the Bay.

Riverside Drive provides approximately 6ha of tidal flats, with roosting areas confined to a beach and small sandspit at the outlet of a small creek at Scott Park. Bar-tailed Godwit regularly used the site however numbers have declined at high tide, probably due to wind and water erosion of the sandspit. Woodlands Road Reserve provides approximately 5ha of mudflats, providing feeding habitat for the Bar-tailed Godwit. Quibray Bay supports a steady population of Bar-tailed Godwits, with roosting sites including small beaches and nearby oyster lease posts. Gaps in data show that shorebirds move to other locations in Botany Bay depending on weather conditions, for example, in adverse conditions birds will avoid the exposed oyster leases. Because of this, additional roost sites at Sandringham, Spit Island and Carters Shoals were also monitored.

Parramatta Estuary

Sites around Parramatta River Estuary were used as reference locations for the Curlew Sandpiper. The area also provides habitat for large numbers of Bar-tailed Godwit. Hen and Chicken Bay provides feeding and roosting sites with several small beaches, rocky outcrops and jetties. Alternative habitat for Curlew Sandpiper and other shorebirds is available in tidal saltmarsh wetlands at Mason Park and the Waterbird Refuge at Homebush.

Boat Harbour

Boat Harbour is a medium-sized sandstone reef (approximately 3ha) located on the northeast of Bate Bay. The survey area selected as a reference site provides valuable shelter for migratory shorebirds, such as Red-necked Stint, Double-banded Plover, Pacific Golden Plover and Ruddy Turnstone, which use the area for feeding at low tide and as a roost site at high tide.

Hunter River Estuary

The Hunter River Estuary supports a stable population of Pacific Golden Plover, with most found foraging in the North Arm of the Hunter River upstream of Stockton Bridge and into Fullerton Cove. It's important to note that this is a much larger site than Penrhyn Estuary. Counts would be expected to be of very different orders of magnitude when comparing areas of such different size. Where comparisons were made between Penrhyn Estuary and the Hunter Estuary the means of each sample were adjusted to make them equal before regression analysis. Counts were carried out at the main roost site on a weekly basis from September to March each year to coincide with the presence of the birds in the estuary. No significant numbers of birds remain over the winter period; therefore no surveys were carried out between April and August.

3 Preliminary Findings

All key species monitored at Penrhyn Estuary are migratory, so during the off-peak season, it is expected that most, if not all, would be in their breeding grounds in the northern hemisphere. One exception is the Double-banded Plover, who spends its non-breeding season in Australia between February-August, returning to breed in New Zealand between August-March. Four of six key species were observed at Penrhyn Estuary in this survey period, the Bar-tailed Godwit, Double-banded Plover, Pacific Golden Plover and Red-necked Stint (Table 2). Neither the Red Knot or Curlew Sandpiper were observed at the study site during this survey period, however, both were observed on one occasion at their reference sites (Red Knot one individual observed at Boat Harbour 20/07/2012; two Curlew Sandpiper observed at Waterbird Refuge on 31/08/2012).

Some migratory species were found to prefer using the site during nocturnal periods. The Pacific Golden Plover was only observed at Penrhyn Estuary during two nocturnal surveys (5 individuals on 3/4/2012; 4 individuals on 20/4/2012), with no sightings during daylight hours. The Bar-tailed Godwit also favoured the site as both a nocturnal feeding and roosting site (Figure 1a and 1b). Peak counts of Bar-tailed Godwit at low tide were greatest during Penrhyn nocturnal surveys, much higher than diurnal counts and higher than peak counts at reference sites in all months except July and August (Figure 1a). Bar-tailed Godwit high tide nocturnal counts were again higher than diurnal counts at Penrhyn, however, they were more numerous at reference sites in April, May and June (Figure 1b). Double-banded Plover used Penrhyn Estuary more frequently at low tide (diurnal), with higher peak counts than those at the reference site (Figure 2a). Double-banded Plover high tide counts were greater at the reference location (Figure 2b); however, counts were quite variable which has been a common observation with this particular species in previous years. Peak counts of Red-necked Stint were consistently higher at the reference site compared to Penrhyn (Figures 3a and 3b). Nocturnal counts for both the Double-banded Plover and Red-necked Stint appeared to be quite low, however, it is possible that this is due to difficulties of identification during nocturnal counts when trying to distinguish between the similar sized Red-capped Plover who are numerous in the estuary year-round.

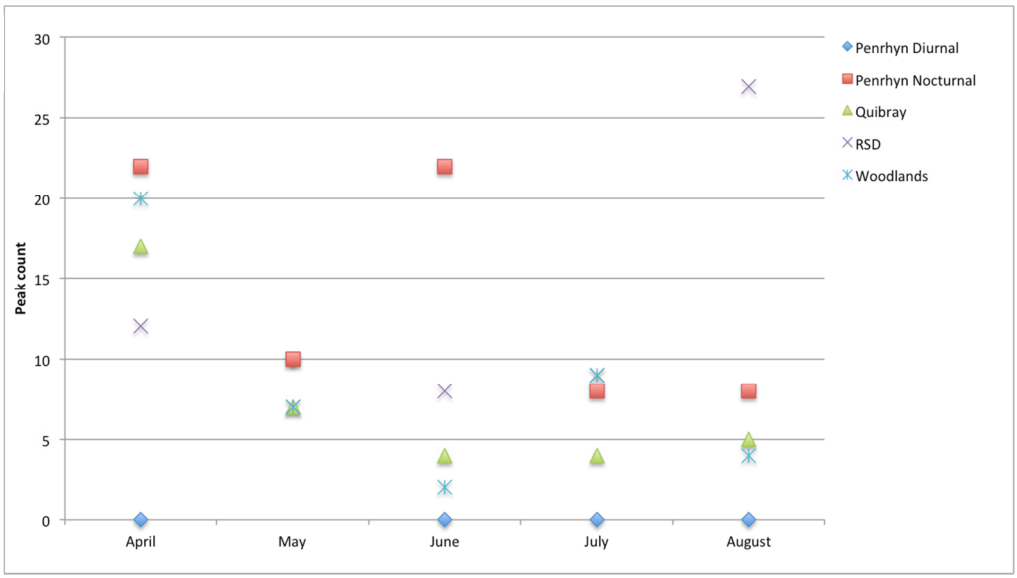
Further analysis after the peak season counts for 2012-2013 will provide a better indication of the success of the PEHEP works in the post-construction phase with the return of the key migratory species.

Table 2 Species observed at Penrhyn Estuary during study period

Common name	Diurnal	Nocturnal	EPBC	TSC
Australian Pelican	✓	✓		
Bar-tailed Godwit*	✓	✓	M	
Black-winged Stilt	✓	✓		
Caspian Tern	✓			
Chestnut Teal	✓			
Crested Tern	✓			
Double-banded Plover*	✓	✓	M	
Great Cormorant	✓			
Kelp Gull	✓			
Little Black Cormorant	✓			
Little Egret	✓			
Little Pied Cormorant	✓			
Masked Lapwing	✓	✓		
Pacific Black Duck	✓	✓		
Pacific Golden Plover*		✓	M	
Pied Cormorant	✓			
Pied Oystercatcher	✓	✓		V
Red-capped Plover	✓	✓		
Red-necked Stint*	✓		M	
Royal Spoonbill		✓		
Silver Gull	✓	✓		
White-faced Heron	✓			
White-necked Heron	✓			

* Key species
EPBC Species protected under the *Environment Protection and Biodiversity Conservation Act 1999* (migratory species)
TSC Species protected under the *Threatened Species Conservation Act 1995* (Vulnerable species)

a)



b)

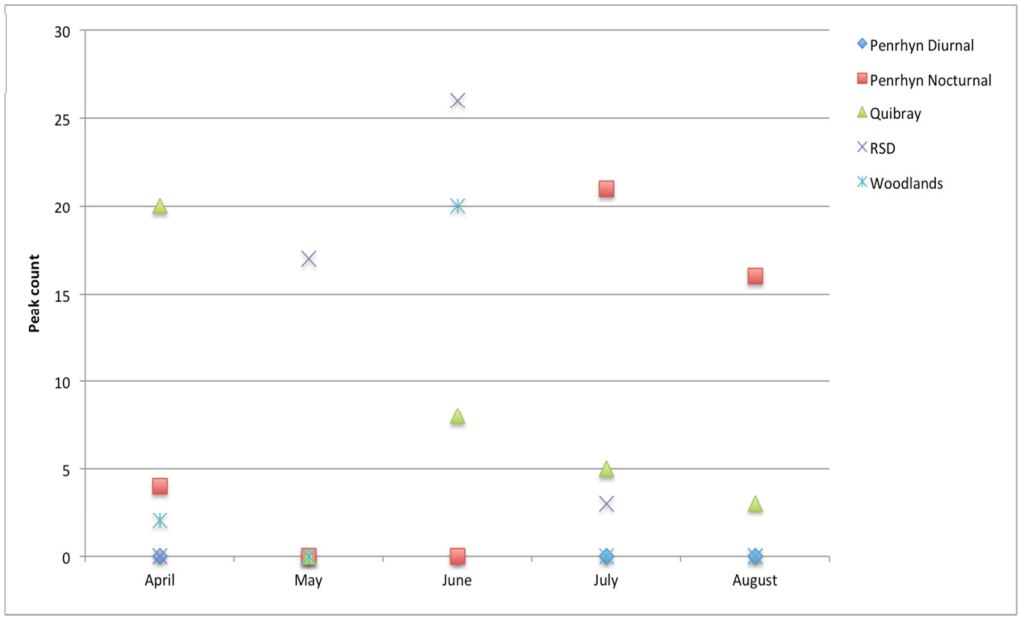
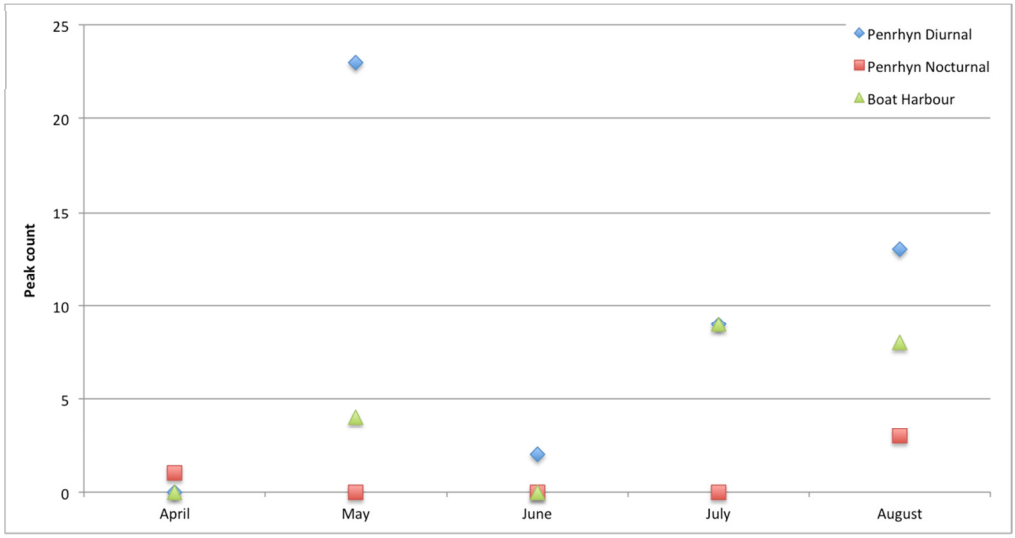


Figure 1 Peak counts of Bar-tailed Godwit at a) Low tide and b) High tide

a)



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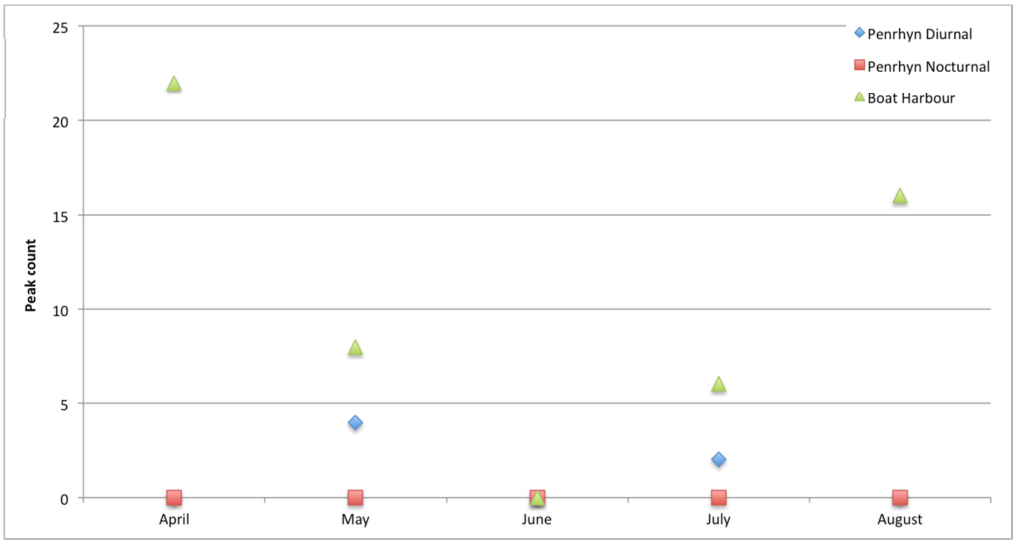
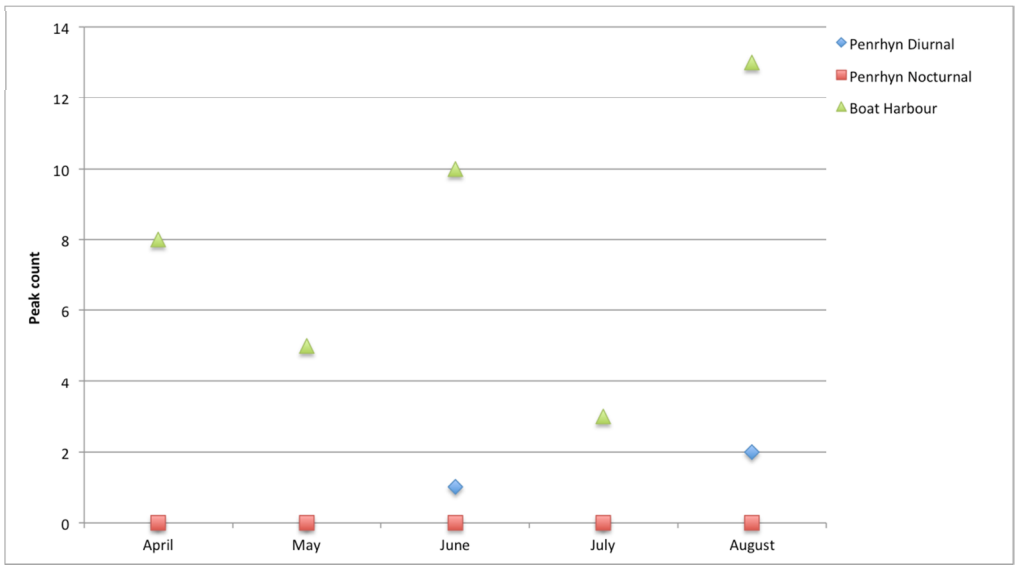


Figure 2 Peak counts of Double-banded Plover at a) Low tide and b) High tide

a)



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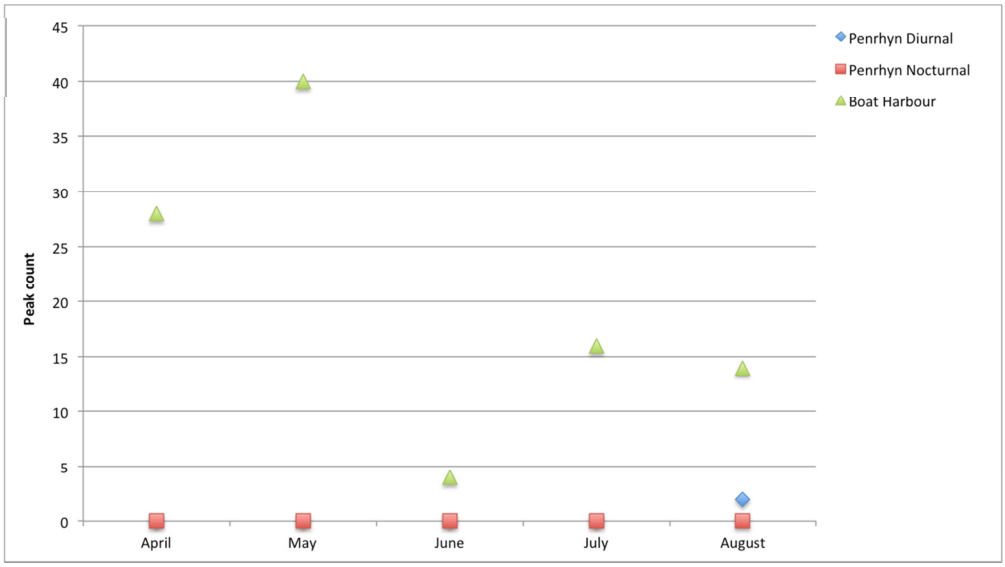

Figure 3 Peak counts of Red-necked Stint at a) Low tide and b) High tide

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APPENDIX A

FIELD SAMPLING LOCATIONS

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Figure A1 Penrhyn Estuary Post-Construction

Figure A2 Monitoring Locations on Botany Bay Southern Shores and Boat Harbour

Figure A3 Monitoring locations within Parramatta River Estuary

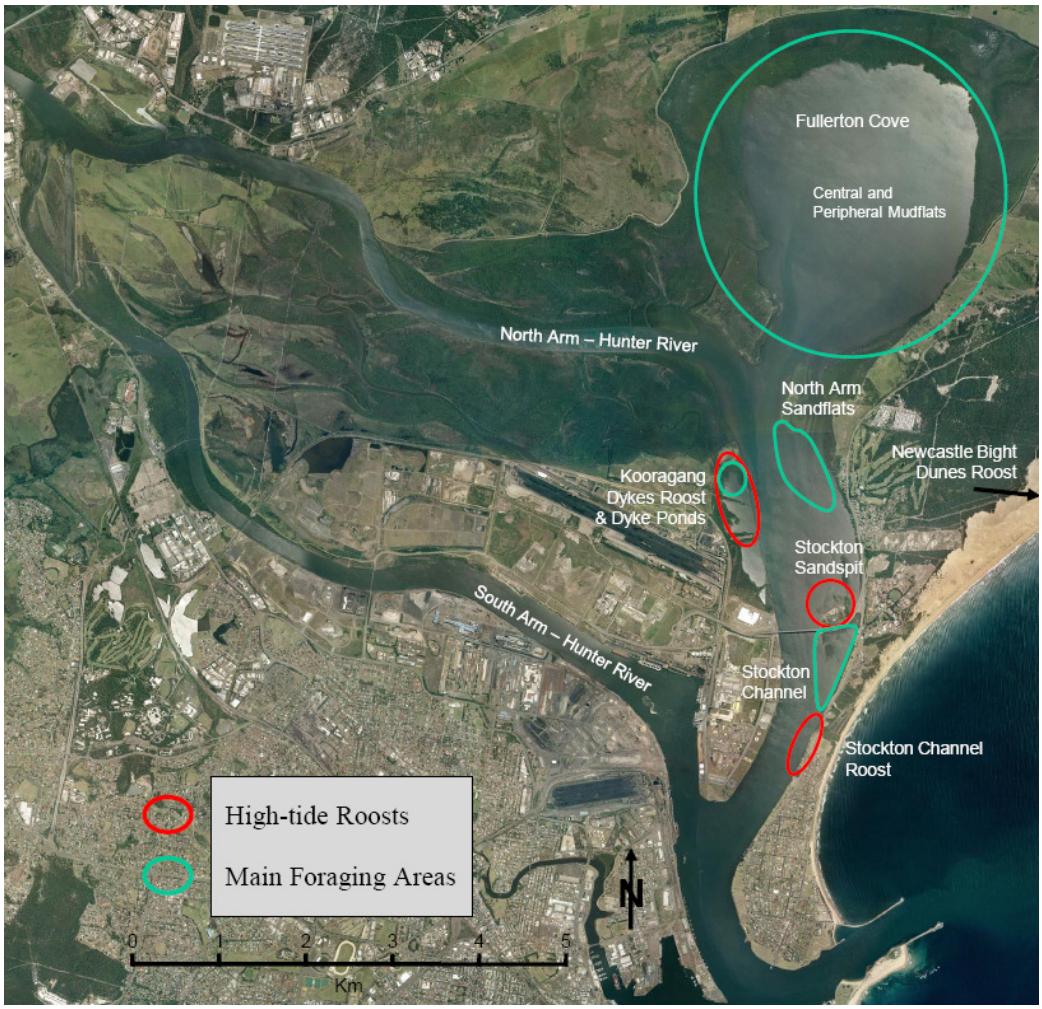

Figure A4 Pacific Golden Plover diurnal roosting and foraging sites in the Hunter River Estuary