Environmental Approval & Compliance Solutions

# Shorebird Monitoring Study for the Townsville Port Expansion Project November 2019 to February 2020

Port of Townsville Limited

# Document Control Summary

***NRA Environmental Consultants***

| | | | |
|---|---|---|---|
| **NRA Filepath:** | F:\AAA\349_TPort\349008-CU Shorebird Monitoring 2019-2020\Rpt\R02\CU_Shorebird_Monitoring19-20_report_R02.docx | | |
| **Status:** | R02 | **Date of Issue:** | 21 May 2020 |
| **Project Manager:** | Peter Buosi | | |
| **Title:** | Shorebird Monitoring Study for the Townsville Port Expansion Project November 2019 to February 2020 | | |
| **Client:** | Port of Townsville Limited | | |
| **Client Contact:** | Tim Smith, Environmental Advisor | | |
| **Copies Dispatched:** | PDF | | |
| **Other Info or Requirements:** | Final report supersedes and replaces all previous documentation prepared. | | |

| **Report Summary** | |
|---|---|
| **Key Words** | Port of Townsville Limited, Port, migratory, shorebirds, Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, EPBC Act |
| **Abstract** | Port of Townsville Limited (Port) has commenced Stage 1 of the Port of Townsville Expansion Project (PEP). This report presents the results of a shorebird monitoring study conducted coincidental with the pre-construction phase of Stage 1 of the PEP. The monitoring study is a requirement of the PEP Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) approval. |

| **Citation** |
|---|
| This report should be cited as:<br>NRA 2020, *Shorebird Monitoring Study for the Townsville Port Expansion Project November 2019 to February 2020*, R02, prepared by NRA Environmental Consultants for Port of Townsville Limited, 21 May 2020. |

| **Quality Assurance** | | | | | |
|---|---|---|---|---|---|
| **Author** | **Technical Review** | **Editor** | **Document Version** | **Approved for Issue by QA Manager** | |
| | | | | **Date** | **Signature** |
| Peter Buosi BAppSci (Hons) | Lindsay Popple PhD, BSc (Hons) | Bianca Weller, BA | R01 | 17/4/2020 |  |
| | - | Kirsty Anderson BA(Hons) | R02 | 21/5/2020 |  |



Certified Integrated Management System
AS/NZS ISO 9001:2015 (Quality)
AS/NZS ISO 14001:2015 (Environment)
AS/NZS 4801:2001 (Safety)

JAS-ANZ
www.jas-anz.com.au/register

## Limitations of this Report

The information in this report is for the exclusive use of Port of Townsville Limited, the only intended beneficiary of our work. NRA cannot be held liable for third party reliance on this document. This disclaimer brings the limitations of the investigations to the attention of the reader. The information herein could be different if the information upon which it is based is determined to be inaccurate or incomplete. The results of work carried out by others may have been used in the preparation of this report. These results have been used in good faith, and we are not responsible for their accuracy. The information herein is a professionally accurate account of the site conditions at the time of investigations; it is prepared in the context of inherent limitations associated with any investigation of this type. It has been formulated in the context of published guidelines, legislation in force at the date of this report, field observations, discussions with site personnel, and results of laboratory analyses. Any change to published guidelines or legislation may change the opinions of NRA expressed in this document. NRA's opinions in this document are subject to modification if additional information is obtained through further investigation, observations or analysis. They relate solely and exclusively to environmental management matters, and are based on the technical and practical experience of environmental practitioners. They are not presented as legal advice, nor do they represent decisions from the regulatory agencies charged with the administration of the relevant Acts. Any advice, opinions or recommendations contained in this document should be read and relied upon only in the context of the document as a whole and are considered current as of the date of this document.

# Table of Contents

## Tables



## Graphs

## Figures



## Plates



## Appendices

# 1. Introduction

## 1.1 Project context

On 5 February 2018, Port of Townsville Limited (Port) received approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) for the Townsville Port Expansion Project (PEP). Condition 12 of the EPBC Act approval (EPBC 2011/5979) requires the implementation of '*a program to monitor the potential impacts to shorebirds before and during construction activities in the marine environment*'. In response to this requirement, Port has developed and commenced a Shorebird Monitoring Program to achieve the following objectives.

- **Objective One**: develop a Shorebird Monitoring Program to monitor potential impacts to shorebirds before and during construction activities.
- **Objective Two**: conduct a survey of shorebirds in the PEP area and on the nearby Ross River sand spit prior to construction to identify and record the abundance of each bird species.
- **Objective Three**: monitor and report on changes to shorebird roosting and foraging, beyond natural spatial and temporal variation, during the project construction activities in the marine environment, to identify any impacts from the project on shorebirds.
- **Objective Four**: provide recommendations on key areas of actual impact and potential mitigation measures should impacts be detected.
- **Objective Five**: contribute to improving public awareness on local avifauna biodiversity and species richness in the vicinity of the project area.

A shorebird survey was completed in early 2019 (NRA 2019) prior to construction works, fulfilling Objectives One and Two. Pre-construction works for Stage 1 of the PEP, the Channel Upgrade (CU) project, commenced soon after the completion of the NRA (2019) study. The CU project shall involve the following works (locations as per mapping in **Appendix A**):

- supply and haulage of marine-grade armour rock required for rock walls and revetments
- creation of a new reclamation area (approximately 62 ha), via the construction of rock walls and revetments, to receive capital dredge material from the channel widening works
- capital dredging to widen the Platypus Channel
- capital dredging to widen the Sea Channel.

## 1.2 Scope

NRA Environmental Consultants (NRA) was commissioned by Port to undertake works to address Objectives Three and Four, as described above. The Shorebird Monitoring Program will operate for the duration of construction, which is estimated as three years. The scope relevant to the 2019/20 monitoring season is as follows.

- Develop a work method in line with the draft *Shorebird Monitoring Plan* (Port 2019).
- Conduct five shorebird monitoring events.
  - Surveys will nominally occur once per month between October 2019 and February 2020 (the period of peak shorebird abundance at the site).

  - The surveys will be designed to permit comparison with previous work (NRA 2012, 2019), be repeatable during and post construction and address the PEP EPBC Act approval requirement for monitoring.
- Annual reporting (this report) following the shorebird monitoring surveys will include:
  - study context, scope and methods
  - a description of shorebird habitat within the study area
  - a description of shorebird species composition (*ie* a species list) present in the study area.
  - Identify any species listed as Endangered, Vulnerable, Near Threatened and/or Migratory under the EPBC Act and/or the Queensland *Nature Conservation Act* 1992 (NC Act) occurring in the study area, and their abundance.
  - Assess the significance of observed species, abundances and habitats with reference to EPBC Act policy.
  - Compare the results of surveys before (NRA 2019) and during CU project construction activities, and previous surveys reported in NRA (2012), noting any changes in the significance of identified values to shorebirds and potential CU project-related impacts.
  - Include recommendations if any adverse impacts to shorebirds are detected.
  - Include, as an appendix to the report, a summary of findings of public interest and site-specific photographs (for use in communication tools for public consumption).

The geographic scope (or study area) will, to the extent that is practical given safety and logistical matters associated with the CU project construction works, replicate that assessed by NRA (2012, 2019), and will comprise:

- Port of Townsville land (PoT):
  - Eastern Reclaim Area between the Marine Precinct and the proposed reclamation area
  - the vacant area of the Marine Precinct (southern area)
  - rock walls along the Eastern Reclaim Area and Marine Precinct
  - intertidal area between the Marine Precinct and Benwell Road (an undeveloped section of Lot 773 on SP223346)
- sand spit area at the mouth of Ross River (**Figure 1**).

## 1.3 Terminology

Shorebirds, also known as waders, refer to a subset of bird families, notably Charadriidae (*eg* plovers and dotterels) and Scolopacidae (*eg* curlews, godwits and sandpipers), belonging to the order Charadriiformes. These birds commonly feed by wading in shallow water or saturated substrate along the shores of lakes, rivers and the sea (Geering *et al*. 2007). They include a large group of species that migrates annually along the East Asian–Australasian flyway (EAA flyway) between Australia and areas as far north as the Arctic Circle, and a smaller group of species that permanently resides in Australia. Many of these migratory and resident species are listed as Migratory under the EPBC Act.

Shorebirds often share their coastal habitats with a range of other waterbirds; notably seabirds of the family Laridae (terns and gulls) and various wetland species in the families Ardeidae (herons and egrets), Threskiornithidae (spoonbills and ibis) and Anatidae (ducks, geese and swans). Some species in the Laridae family are listed as Migratory under the EPBC Act. The coastal Migratory seabird populations around Townsville undertake seasonal

movements, sometimes into and out of the region, though they do not undertake transcontinental migrations.

Some of the above bird species are listed as Threatened under the EPBC Act and NC Act. Threatened species categories under the EPBC Act comprise Critically Endangered, Endangered or Vulnerable. Under the NC Act, Threatened is limited to the Endangered or Vulnerable categories. Migratory species under the EPBC Act are recognised as Special Least Concern under the NC Act.

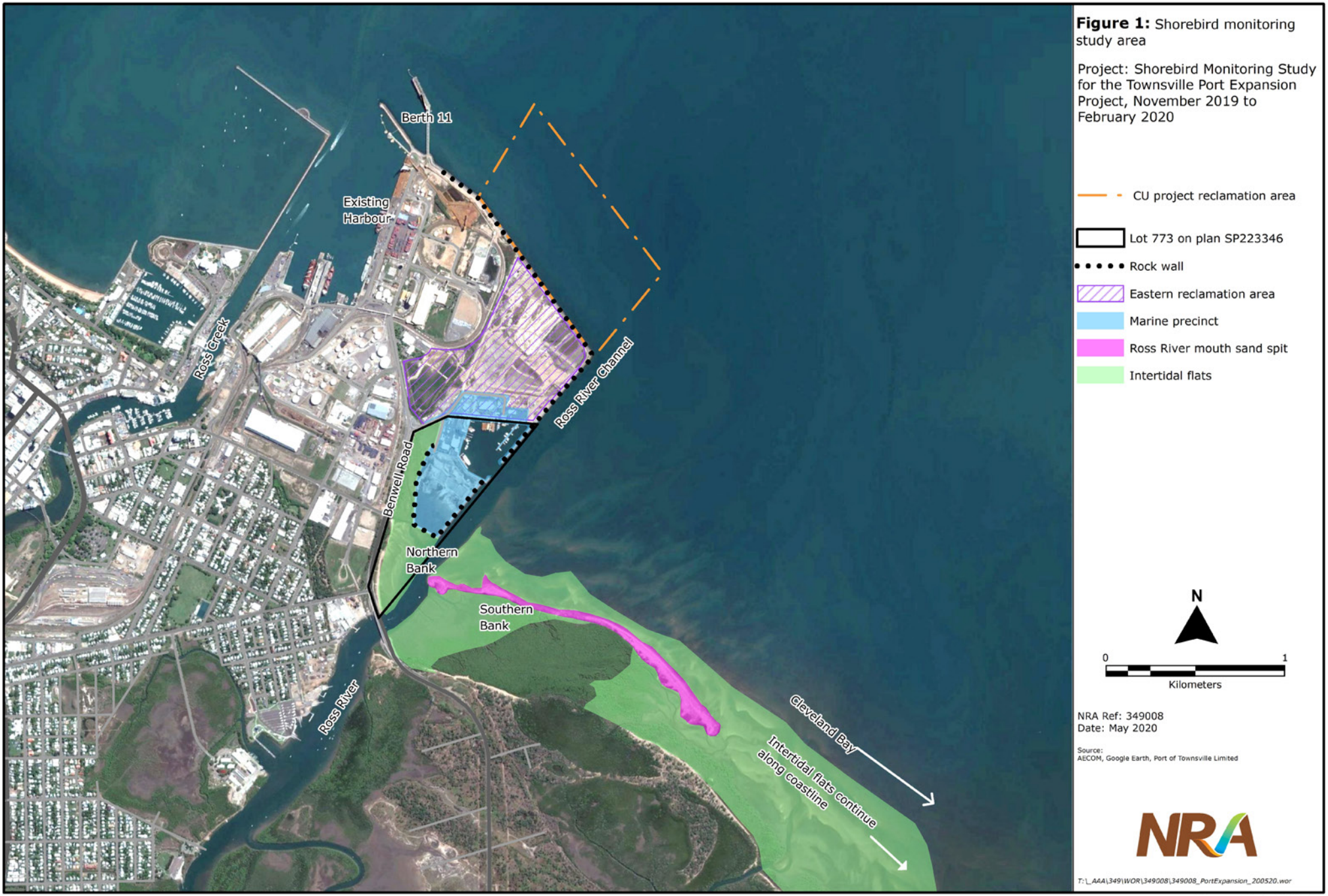



**Figure 1:** Shorebird monitoring study area

Project: Shorebird Monitoring Study for the Townsville Port Expansion Project, November 2019 to February 2020

NRA Ref: 349008
Date: May 2020

Source:
AECOM, Google Earth, Port of Townsville Limited

T:_AAA\349\WOR\349008\349008_PortExpansion_200520.wor

Recommended print size: A4

# 2. Background

## 2.1 Study area

The PEP area occurs near the mouth of the Ross River in Townsville. The Ross River mouth area contains terrestrial, intertidal and inshore marine habitats that are used by a diverse range of coastal bird species. Of particular significance in this area is the sand spit near the river mouth and intertidal banks (or flats) that extend from the river mouth south-east along Cleveland Bay. The intertidal areas and sand spit provide ideal foraging and roosting habitat for a variety of shorebirds and waterbirds, including Threatened and Migratory (T&M) species. Previous studies have found that the area supports T&M shorebird populations that are of national and international significance with respect to species richness and abundance (NRA 2005, 2008, 2012, 2019, 2020, Driscoll 2009), with the majority of this population being transient.

PoT is on the northern bank of the Ross River mouth. The developed areas are predominantly built on reclaimed land and contain administration buildings, ship loading facilities, and storage facilities. PoT also contains recently reclaimed areas (currently undeveloped) where future development is planned. The fill material used in the reclamation areas includes marine sediments obtained from dredging activities within and around PoT. NRA (2012) recorded T&M shorebirds foraging in and roosting on sections of reclaimed land, and on some occasions certain shorebird species were present in nationally significant numbers. Land reclamation is a gradual process and the PoT land contains areas at various stages of reclamation. The lower lying habitats within the reclamation area are therefore transitional habitats and the use of these areas by T&M birds will evolve throughout the reclamation process.

The PoT's northern and eastern boundaries are protected by constructed rock walls. The seaward edge of the rock walls is subject to tidal inundation and spray from wave action. The wet and dry cycles experienced along the seaward edge vary with tides, sea state and rainfall. These conditions are favourable for many species of mollusc and crustacean, which are a food source for a variety of waterbirds. Rock walls may be used by waterbirds as perches for hunting, feeding and resting. These man-made structures provide similar habitats to naturally occurring rocky headlands and foreshores, such as those found nearby at Kissing Point and Magnetic Island (approximately 4 km and 8 km from the study area respectively). NRA (2012, 2019) recorded small numbers of T&M birds around the Marine Precinct rock walls, but very little bird activity around the Eastern Reclamation Area rock walls.

## 2.2 General bird use patterns of the Ross River mouth and surrounds

Based on work by NRA (2005, 2008, 2012, 2019, 2020) and Driscoll (2009), during high tide, most T&M shorebirds from the local population and various other waterbirds move to the sand spit in the Ross River mouth to roost. This site is an ideal roost because it is near suitable foraging habitat, provides unobstructed visibility of potential predators and is relatively isolated from the mainland at high tide. Isolation at high tide is important because it affords roosting birds a degree of protection from land-based predators and human disturbance. Such areas are uncommon along the Queensland coastline and very uncommon in the Townsville region. Driscoll (1997, 2009) assessed the Ross River site as being the most significant in the region and ranking within the top 40 sites for shorebirds along the east coast of Queensland. While the sand spit is outside the PEP area, it plays an important

role in the dynamics of the local shorebird population and was therefore included in the study area.

As the tide recedes, seabirds move off the sand spit to forage in the surrounding open waters while shorebirds forage on the nearby intertidal flats. The majority of shorebirds use the flats to the south-east of the river mouth (*ie* Cleveland Bay), notably the area near Sandfly Creek (approx. 2.3 km south-east of sand spit), with smaller numbers venturing farther south into Cleveland Bay or along the banks of the Ross River (NRA 2005, 2008, 2012, Driscoll 2009). The historical preference of shorebirds for the Sandfly Creek area could be related to the nutrient rich outfall from the Cleveland Bay Sewage Treatment Plant (Pell & Lawler 1996), though the Sewage Treatment Plant has since been upgraded.

While the majority of local T&M shorebirds and seabirds roost on the sand spit and forage on nearby intertidal banks, NRA (2012, 2019) found that some birds from this population used habitats on PoT. This included 18 Migratory bird species and six Threatened (EPBC Act and/or NC Act) species[1]. Of the Migratory birds using PoT, the Lesser Sand Plover (*Charadrius mongolus*; Endangered, EPBC Act and NC Act), Greater Sand Plover (*Charadrius leschenaultii*; Vulnerable, EPBC Act and NC Act) and Red-necked Stint (*Calidris ruficollis*; not a Threatened species), were the most abundant and sometimes observed in nationally significant numbers during summer high tides.

Low levels of bird activity occur along and near the northern and eastern rock walls (*eg* breakwaters) around PoT. NRA (2012, 2019) recorded small numbers of Grey-tailed Tattler (*Tringa brevipes*), Common Sandpiper (*Actitis hypoleucos*), Whimbrel (*Numenius phaeopus*), Sooty Oystercatcher (*Haematopus fuliginosus*) and Striated Heron (*Butorides striata*) using these areas, particularly the rock walls around the Marine Precinct (Grey-tailed Tattler, Common Sandpiper and Whimbrels are Migratory species). Migratory-listed terns (Caspian Tern, *Hydroprogne caspia*, Little Tern, *Sternula albifrons* and Crested Tern, *Thalasseus bergii*) occasionally forage in waters adjacent to the rock walls.

## 2.3 Assessing significance

Under the EPBC Act, 'important habitat' is a key concept for assessing the significance of an area to Migratory shorebirds (DoEE 2017). EPBC Act Policy Statement 3.21 '*Significant impact guidelines for 36 migratory shorebird species*' (DoEE 2017) states that sites contain important habitat when they support 2,000 or more Migratory shorebirds, 15 or more Migratory shorebird species or individual Migratory shorebird species abundance above thresholds for national significance. The threshold for national significance is 0.1% of the EAA flyway population for a given species. The most recent EAA flyway population estimates are available in Hansen *et al.* (2016). Sites supporting 20,000 or more waterbirds or ≥1% of the EAA flyway population are considered to be of international significance.

## 2.4 Species status

The legislative status of some species under the EPBC Act and NC Act changed in the period between NRA (2012) and NRA (2019); these are documented in NRA (2019). No further changes in legislative status relevant to the monitoring program have occurred since NRA (2019). Species status is current as of 30 March 2020.

[1] The legislative status for some species has changed since NRA (2012).

# 3. Methods

## 3.1 Overview

### 3.1.1 General methods

The surveys were conducted between November 2019 and February 2020 on the dates shown in **Table 1**. The survey period was primarily chosen because overall shorebird abundance in the Ross River mouth (*ie* sand spit and adjacent intertidal areas) is highest during the spring and summer months (Driscoll 2009, NRA 2020). The survey area comprised developed (Marine Precinct, Eastern Reclamation Area and rock walls along the Marine Precinct and eastern side of the Eastern Reclamation Area) and undeveloped sections of PoT (part of South Townsville Beach, *ie* intertidal area between the Marine Precinct and Benwell Road[2]), and the Ross River mouth sand spit (**Figures 1** and **2**).

The surveys were undertaken using binoculars (10 x 42) and, when necessary, a spotting scope (Swarovski ATS 65 mm).

**Table 1: Survey dates, locations and corresponding tides during the 2019/20 CU project shorebird monitoring study**

| Date | Survey area[1] | Tide times | Tide height (m) |
|---|---|---|---|
| 27 November 2019 | Sand spit | 0931 (High) | 3.47 |
| 28 November 2019 | Port of Townsville | 1018 (High) | 3.35 |
| 11 December 2019 | Port of Townsville | 0829 (High) | 3.30 |
| 12 December 2019 | Sand spit | 0904 (High) | 3.39 |
| 21 January 2020 | Port of Townsville | 0726 (High) | 3.49 |
| 22 January 2020 | Sand spit | 0802 (High) | 3.62 |
| 22 January 2020 | Port of Townsville | 1439 (Low) | 1.15 |
| 6 February 2020 | Sand spit | 0731 (High) | 3.42 |
| 6 February 2020 | Port of Townsville | 1403 (Low) | 1.37 |
| 7 February 2020 | Port of Townsville | 0804 (High) | 3.67 |

[1] Port of Townsville survey areas comprised the Marine Precinct (including rock wall), Eastern Reclamation Area (rock wall along the eastern side), intertidal area between the Marine Precinct and Benwell Road (section of Lot 773 on SP223346) (**Figure 1**). The sand spit extends east of the Ross River mouth.

### 3.1.2 Variation in methods

While the survey methods generally follow those previously implemented (NRA 2012, 2019), the following variations occurred.

- **Survey timing:** In the 2019/20 season (this study), monthly surveys were conducted between November and February. A survey in October did not occur due to the delayed timing of project commissioning. While high tide surveys occurred each month, low tide surveys occurred only in January and February. This reduced effort at low tide was because NRA (2019) found very low Migratory bird presence on PoT land during low tides, and the expectation was that this pattern would continue in the 2019/20 season (this study). In comparison, NRA (2012) assessed T&M bird presence on PoT via three high and low tide surveys in November, and one high and low tide survey per month in December, January and February. NRA (2019) assessed T&M bird presence on PoT land via one high and low tide survey per month between October and January.

[2] This area is an undeveloped section of Lot 773 on SP223346.

- **Rock wall count areas**: The NRA (2012, 2019) studies had nine fixed count areas along the rock wall (RW1 to RW9). Access to RW1 to RW5 (along the northern-facing rock wall) was restricted in the 2019/20 season (this study) due to construction works in the adjacent areas, and access is likely to remain impractical during the CU project construction phase. Therefore, RW1 to RW5 count areas were excluded from the survey. NRA (2012, 2019) reported very low levels of bird activity along the rock walls, including areas encompassing RW1 to RW5.

## 3.2 Port of Townsville land

Surveys within the PoT section of the study area involved formal bird counts at fixed locations, informal searches for birds and habitat assessments. Formal counts involved visiting count areas (**Figure 2**) and recording the abundance of each bird species and noting their behaviours. The survey period was approximately two hours either side of the relevant high or low tide.

Count areas along the rock wall (sites RW6 to RW9, **Figure 2**) were 250 m apart. Included in the counts were birds perching or foraging along the rock wall and/or foraging within 250 m in the adjacent ocean waters. All birds within 250 m of the observation point (sites RW6 to RW9, **Figure 2**) were recorded. The overlap between the rock wall count areas was intentionally done to counteract the obscured visibility caused by the rocks.

Counts at the Marine Precinct (reclaimed land and rock walls of MP1 and MP2, **Figure 2**) and of the adjoining intertidal area (STB1a to STB1c, **Figure 2**) were made from vantage points along the western rock wall of the Marine Precinct.

Count areas within the Eastern Reclamation Area comprised ER1 to ER6 (**Figure 2**) and counts were made from vantage points that offered good visibility without causing birds to flee or change their behaviour. Temporary offices and support facilities were constructed over most of ER2 in early January 2019, rendering the affected areas unsuitable for shorebirds during the 2019–2020 survey (this study).

## 3.3 Sand spit

A boat was used to access the sand spit and land-based counts were made from vantage points that offered optimal views without disturbing birds. Surveys commenced approximately one to 1.5 hours prior to high tide and ended when a satisfactory count was achieved, usually within the hour after high tide.

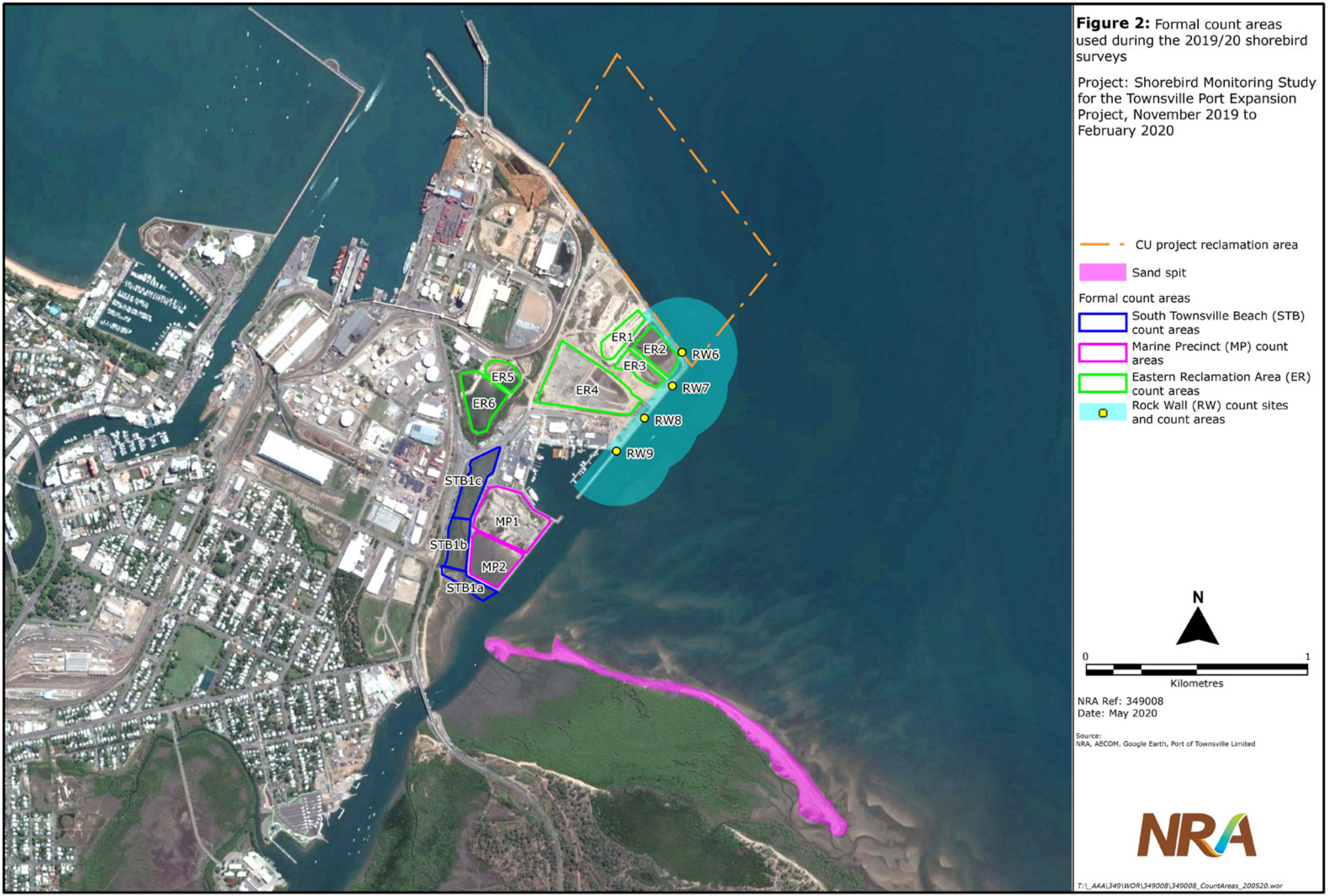



**Figure 2:** Formal count areas used during the 2019/20 shorebird surveys

Project: Shorebird Monitoring Study for the Townsville Port Expansion Project, November 2019 to February 2020

Recommended print size: A4

# 4. Results

## 4.1 Survey conditions

### 4.1.1 Changes to Threatened and Migratory bird habitats

The habitats within the study area have changed little to those reported by NRA (2019) during the baseline assessment. As described in NRA (2019), these conditions differ markedly to those reported by NRA (2012) during the impact assessment phase. The main difference being a reduced extent of artificial wetland habitats[3] in the Eastern Reclamation Area and Marine Precinct, and mangrove colonisation of the intertidal flats on the Northern Bank (**Figure 1**). These changes reduced the quality of these sites as habitat for shorebirds.

The amount of construction activity associated with the CU project was higher during the current study relative to the baseline study (NRA 2019). This activity was concentrated in the area west of ER1 (**Figure 2**) and involved the haulage and stockpiling rocks destined for later use in rock wall construction.

### 4.1.2 Weather

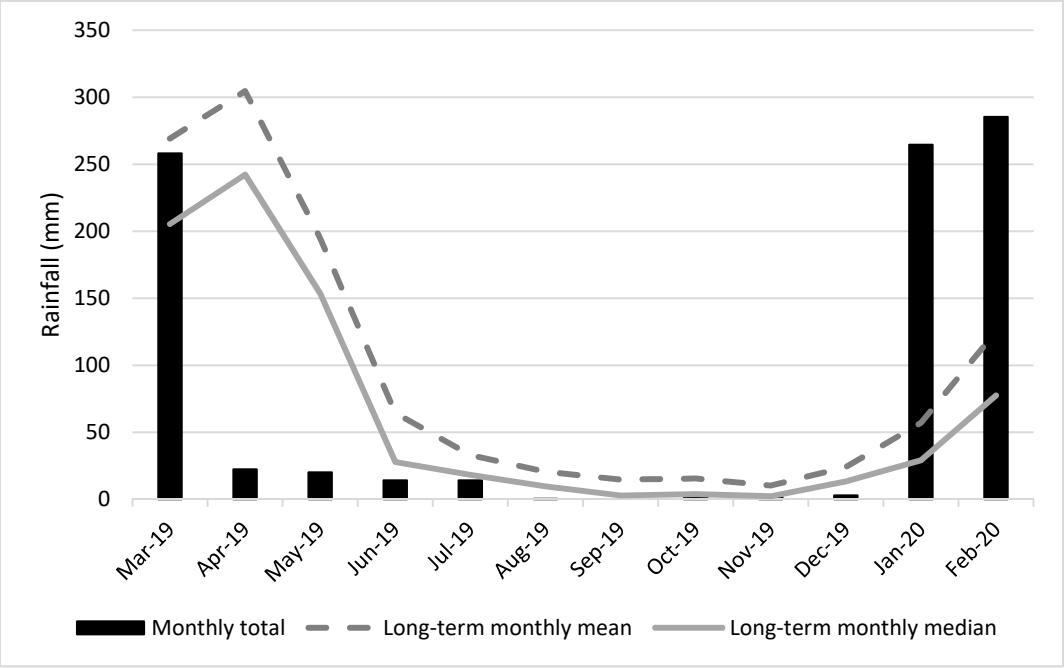
No extreme weather events (*eg* tropical cyclones, flooding) occurred during or immediately prior to any of the 2019/20 surveys. Monthly rainfall totals for the 2019/20 survey period and preceding months is shown on **Graph 1**. Weather data was obtained from the Bureau of Meteorology (BOM) website (www.bom.gov.au) and is based on records from the Townsville Airport, which is approximately 7 km from the study area. The data shows that Townsville received below average rainfall immediately prior to and during the first half of the survey period (November and December 2019), with above average rainfall during the second half of the survey period (January and February 2020) (**Graph 1**). These rainfall patterns are relevant given that some bird species behaviours are influenced by rainfall.

Townsville experienced a heavy rainfall event and flooding in February 2019. Flooding and severe storm events are of interest because they can alter the movement of sediments in the Ross River mouth and surrounds, thereby altering the location of habitats relevant to T&M shorebirds.

### 4.1.3 Tides

Tide times and heights during survey events are shown in **Table 1**. Habitats along the rock wall (sites RW6 to RW9), the intertidal areas (STB1a to STB1c) and the sand spit are influenced by tide heights. The influence of tide heights should be considered when reviewing the following results.

[3] The land reclamation process results in temporary artificial wetland habitats. During the NRA (2012) study, ER2 and MP2 contained sections of shallow water that were used by large numbers of certain T&M shorebird species.




**Graph 1: Monthly rainfall (2019/20) and long-term average and median rainfall recorded at the Townsville Aero BOM weather station (BOM 2020)**

## 4.2 Field survey results

### 4.2.1 Overview

Consistent with the project scope, the following sections focus on results relating to T&M birds recorded on PoT; *ie* less attention is devoted to non-Migratory species and results from the sand spit. The only species recorded in this study that is listed as Threatened (Vulnerable, NC Act), but not listed as Migratory, is the Beach Stone Curlew (*Esacus magnirostris*).

### 4.2.2 Species composition, species richness and abundance

#### Species composition and richness

Fifty-nine (59) bird species were recorded across all the 2019/20 surveys and all sites (including the sand spit). The species, their legislative status and general distribution are shown in **Table 2**.

While more bird species were recorded on PoT (53 species) than on the sand spit (24 species)[4], PoT supported fewer Migratory species (15 species) than the sand spit (16 species) (**Table 2**). The minimum and maximum monthly species richness for Migratory birds across the survey period was as follows:

- PoT (Rock Wall, Eastern Reclamation Area, Marine Precinct and STB1a to STB1c) (**Table 3**):
  - high tide (four surveys): eight species (November 2019) to 11 species (February 2020)
  - low tide (two surveys): four species (February 2020) to six species (January 2020)
- sand spit (high tide only):
  - high tide (four surveys): seven species (January 2020) to 13 species (December 2019) (**Table 4**).

[4] The difference in species richness is probably because PoT, and immediate surrounds, contains more habitat types than the sand spit.

Species richness did not exceed the threshold for national significance during the survey period at either the sand spit or the PoT.

**Table 2: Bird species recorded at Port of Townsville (PoT) and the Ross River sand spit (SS) during 2019/20 monitoring program and their legislative status**

| Common name | Scientific name | Status [A] | | Location | |
|---|---|---|---|---|---|
| | | EPBC Act | NC Act | PoT [B] | SS |
| **Threatened species** | | | | | |
| Western Alaskan Bar-tailed Godwit | *Limosa lapponica baueri* | V, M | V | ✓ | ✓ |
| Eastern Curlew | *Numenius madagascariensis* | CE, M | E | | ✓ |
| Great Knot | *Calidris tenuirostris* | CE, M | E | | ✓ |
| Curlew Sandpiper | *Calidris ferruginea* | CE, M | E | ✓ | |
| Greater Sand Plover | *Charadrius leschenaultii* | V, M | V | ✓ | ✓ |
| Lesser Sand Plover | *Charadrius mongolus* | E, M | E | ✓ | ✓ |
| Beach Stone-curlew | *Esacus magnirostris* | – | V | ✓ | |
| **Non-threatened migratory species** | | | | | |
| Black-tailed Godwit | *Limosa limosa* | M | SL | | ✓ |
| Caspian Tern | *Hydroprogne caspia* | M | SL | ✓ | ✓ |
| Common Greenshank | *Tringa nebularia* | M | SL | ✓ | ✓ |
| Common Sandpiper | *Actitis hypoleucos* | M | SL | ✓ | |
| Crested Tern | *Thalasseus bergii* | M | SL | | ✓ |
| Eastern Osprey | *Pandion cristatus* | M | LC | ✓ | |
| Grey Plover | *Pluvialis squatarola* | M | SL | | ✓ |
| Grey-tailed Tattler | *Tringa brevipes* | M | SL | ✓ | ✓ |
| Gull-billed Tern | *Gelochelidon nilotica* | M | SL | ✓ | ✓ |
| Little Tern | *Sternula albifrons* | M | SL | ✓ | ✓ |
| Red-necked Stint | *Calidris ruficollis* | M | SL | ✓ | ✓ |
| Sharp-tailed Sandpiper | *Calidris acuminata* | M | SL | ✓ | ✓ |
| Terek Sandpiper | *Xenus cinereus* | M | SL | ✓ | |
| Whimbrel | *Numenius phaeopus* | M | SL | ✓ | ✓ |
| **Other non-threatened and non-migratory species** | | | | | |
| Australasian Pipit | *Anthus novaeseelandiae* | – | LC | ✓ | |
| Brahminy Kite | *Haliastur indus* | – | LC | ✓ | ✓ |
| Bush Stone-curlew | *Burhinus grallarius* | – | LC | ✓ | |
| Common Myna | *Sturnus tristis* | – | I | ✓ | |
| Golden-headed Cisticola | *Cisticola exilis* | – | LC | ✓ | |
| Great Bowerbird | *Ptilonorhynchus nuchalis* | – | LC | ✓ | |
| Magpie-lark | *Grallina cyanoleuca* | – | LC | ✓ | |
| Mangrove Gerygone | *Gerygone levigaster* | – | LC | ✓ | |
| Mangrove Honeyeater | *Gavicalis fasciogularis* | – | LC | ✓ | |
| Mistletoe Bird | *Dicaeum hirundinaceum* | – | LC | ✓ | |
| Nankeen Kestrel | *Falco cenchroides* | – | LC | ✓ | |
| Nutmeg Mannikin | *Lonchura punctulata* | – | LC | ✓ | |
| Peaceful Dove | *Geopelia striata* | – | LC | ✓ | |
| Rainbow Bee-eater | *Merops ornatus* | – | LC | ✓ | |
| Red-backed Fairy Wren | *Malurus melanocephalus* | – | LC | ✓ | |
| Rock Dove | *Columba livia* | – | I | ✓ | |
| Rufous-throated Honeyeater | *Conopophila rufogularis* | – | LC | ✓ | |
| Welcome Swallow | *Hirundo neoxena* | – | LC | ✓ | |

| Common name | Scientific name | Status [A] | | Location | |
|---|---|---|---|---|---|
| | | EPBC Act | NC Act | PoT [B] | SS |
| White-throated gerygone | *Gerygone olivacea* | – | LC | ✓ | |
| Willy Wagtail | *Rhipidura leucophrys* | – | LC | ✓ | |
| Australasian Darter | *Anhinga novaehollandiae* | – | LC | | ✓ |
| Australian Pelican | *Pelecanus conspicillatus* | – | LC | ✓ | ✓ |
| Australian Pied Oystercatcher | *Haematopus longirostris* | – | LC | ✓ | ✓ |
| Australian Pratincole | *Stiltia isabella* | – | LC | ✓ | |
| Australian White Ibis | *Threskiornis molucca* | – | LC | ✓ | |
| Black-winged Stilt | *Himantopus himantopus* | – | LC | ✓ | |
| Eastern Great Egret | *Ardea modesta* | – | LC | ✓ | |
| Grey Teal | *Anas gracilis* | – | LC | ✓ | ✓ |
| Lesser Crested Tern | *Thalasseus bengalensis* | – | LC | ✓ | ✓ |
| Little Egret | *Egretta garzetta* | – | LC | ✓ | |
| Masked Lapwing | *Vanellus miles* | – | LC | ✓ | |
| Pacific Black Duck | *Anas superciliosa* | – | LC | ✓ | |
| Plumed Whistling-duck | *Dendrocygna eytoni* | – | LC | ✓ | |
| Red-capped Plover | *Charadrius ruficapillus* | – | LC | ✓ | ✓ |
| Royal Spoonbill | *Platelea regia* | – | LC | ✓ | |
| Silver Gull | *Chroicocephalus novaehollandiae* | – | LC | ✓ | ✓ |
| Sooty Oystercatcher | *Haematopus fuliginosus* | – | LC | ✓ | |
| Striated Heron | *Butorides striata* | – | LC | ✓ | |

[A] Status according to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and Queensland *Nature Conservation Act* 1994 (NC Act): Critically Endangered (CE), Endangered (E), Vulnerable (V), Near Threatened (NT), Migratory (M), Special Least Concern (SLC) and Least Concern (LC). Species regarded as non-native are denoted with an 'I' in the status column.

[B] Port of Townsville. Species records from incidental observations and from count areas (Rock Wall, Eastern Reclamation Area, Marine Precinct, and South Townsville Beach (**Figure 2**)).

## Abundance of Threatened and Migratory bird species

The abundance of T&M bird species recorded on PoT is shown in **Table 3**; no Near Threatened bird species were recorded. Red-necked Stint and Greater Sand Plover were the most abundant species, and Red-necked Stint abundance in February 2020 exceeded the threshold for national significance (**Table 3**). During January and February 2020, when high and low tide surveys were conducted, T&M bird species were substantially more abundant on PoT during high tide (*cf* low tide) (**Table 3**).

The abundance of T&M shorebird species recorded on the sand spit is shown in **Table 4**; no Near Threatened bird species were recorded. Five species were present in nationally significant abundances during at least one survey event (Western Alaskan Bar-tailed Godwit, Eastern Curlew, Great Knot, Greater Sand Plover and Whimbrel), with the Great Knot being the most abundant species overall (**Table 4**). Whimbrels were present in nationally significant abundances during every survey. Total Migratory shorebird abundance never exceeded the threshold for significance (**Table 4**).

Between 5% and 32% (average = 14%, n = 4) of the local T&M shorebird population used PoT (primarily for roosting) at high tide, with the majority of the local population using the sand spit (average 86%, n = 4) (**Table 5**). Within PoT, T&M bird abundances at high tide were generally greatest in the Eastern Reclamation Area, and on average 8% (n = 4) of the local population used this area (**Table 5**).

**Table 3: Abundance of Threatened and Migratory bird species recorded on Port of Townsville land[A] during the 2019/20 survey period[E]**

| Common name | Scientific name | Status [B] | | November 2019 | | December 2019 | | January 2020 | | February 2020 | | Significance thresholds [D] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC Act | NC Act | High tide | Low tide [C] | High tide | Low tide [C] | High tide | Low tide | High tide | Low tide | International | National |
| Curlew Sandpiper | *Calidris ferruginea* | CE, M | E | 0 | NS | 0 | NS | 0 | 0 | 2 | 0 | 900 | 90 |
| Lesser Sand Plover | *Charadrius mongolus* | E, M | E | 0 | NS | 0 | NS | 0 | 0 | 60 | 0 | 1800 | 180 |
| Greater Sand Plover | *Charadrius leschenaultii* | V, M | V | 17 | NS | 40 | NS | 30 | 0 | 95 | 0 | 2000 | 200 |
| Western Alaskan Bar-tailed Godwit | *Limosa lapponica baueri* | V, M | V | 0 | NS | 0 | NS | 0 | 1 | 0 | 0 | 3250 | 325 |
| Caspian Tern | *Hydroprogne caspia* | M | SL | 7 | NS | 23 | NS | 3 | 0 | 7 | 2 | NA | NA |
| Common Greenshank | *Tringa nebularia* | M | SL | 4 | NS | 1 | NS | 2 | 1 | 2 | 1 | 1100 | 110 |
| Common Sandpiper | *Actitis hypoleucos* | M | SL | 0 | NS | 0 | NS | 1 | 0 | 0 | 0 | 1900 | 190 |
| Eastern Osprey | *Pandion cristatus* | M | SL | 0 | NS | 0 | NS | 0 | 1 | 0 | 0 | NA | NA |
| Grey-tailed Tattler | *Tringa brevipes* | M | SL | 9 | NS | 11 | NS | 5 | 1 | 3 | 0 | 700 | 70 |
| Gull-billed Tern | *Gelochelidon nilotica* | M | SL | 0 | NS | 5 | NS | 0 | 0 | 5 | 0 | NA | NA |
| Little Tern | *Sternula albifrons* | M | SL | 1 | NS | 15 | NS | 0 | 0 | 0 | 0 | NA | NA |
| Red-necked Stint | *Calidris ruficollis* | M | SL | 0 | NS | 88 | NS | 40 | 0 | 570 | 0 | 4750 | 475 |
| Sharp-tailed Sandpiper | *Calidris acuminata* | M | SL | 15 | NS | 9 | NS | 20 | 3 | 50 | 1 | 850 | 85 |
| Terek Sandpiper | *Xenus cinereus* | M | SL | 1 | NS | 4 | NS | 2 | 0 | 3 | 0 | 500 | 50 |
| Whimbrel | *Numenius phaeopus* | M | SL | 9 | NS | 11 | NS | 2 | 2 | 7 | 2 | 650 | 65 |
| Beach Stone Curlew | *Esacus magnirostris* | - | V | 2 | NS | 2 | NS | 2 | 1 | 2 | 1 | NA | NA |
| **MIGRATORY BIRD SPECIES ABUNDANCE** | | | | 63 | NS | 207 | NS | 105 | 9 | 804 | 6 | NA | 2000 |
| **MIGRATORY BIRD SPECIES RICHNESS** | | | | 8 | NS | 10 | NS | 9 | 6 | 11 | 4 | NA | 15 |
| **THREATENED & MIGRATORY BIRD SPECIES RICHNESS** | | | | 9 | NS | 11 | NS | 10 | 7 | 12 | 5 | NA | NA |

[A] Port of Townsville land comprises the following count areas: Rock Wall, Eastern Reclamation Area, Marine Precinct and South Townsville Beach (**Figure 2**).

[B] Status according to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and Queensland *Nature Conservation Act* 1994 (NC Act): Critically Endangered (CE), Endangered (E), Vulnerable (V), Near Threatened (NT), Migratory (M), Special Least Concern (SLC), Least Concern (LC), Non-native species (I).

[C] NS = No survey conducted.

[D] Significance thresholds with reference to DoEE (2017) and Hansen *et al.* (2016). NA = Not available.

[E] Shaded cells indicate counts that exceed thresholds for national significance.

**Table 4: Abundance of Threatened and Migratory bird species recorded at high tide on Port of Townsville land[A] (PoT) and on the sand spit (SS) during the 2019/20 survey period[D]**

| Common name | Scientific name | Status [B] | | November 2019 | | December 2019 | | January 2020 | | February 2020 | | Significance thresholds [C] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC Act | NC Act | PoT | SS | PoT | SS | PoT | SS | PoT | SS | International | National |
| Curlew Sandpiper | *Calidris ferruginea* | CE, M | E | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 900 | 90 |
| Eastern Curlew | *Numenius madagascariensis* | CE, M | E | 0 | 39 | 0 | 109 | 0 | 3 | 0 | 49 | 350 | 35 |
| Great Knot | *Calidris tenuirostris* | CE, M | E | 0 | 181 | 0 | 835 | 0 | 1465 | 0 | 1300 | 4250 | 425 |
| Lesser Sand Plover | *Charadrius mongolus* | E, M | E | 0 | 0 | 0 | 40 | 0 | 0 | 60 | 0 | 1800 | 180 |
| Greater Sand Plover | *Charadrius leschenaultii* | V, M | V | 17 | 240 | 40 | 310 | 30 | 0 | 95 | 0 | 2000 | 200 |
| Western Alaskan Bar-tailed Godwit | *Limosa lapponica baueri* | V, M | V | 0 | 191 | 0 | 232 | 0 | 326 | 0 | 165 | 3250 | 325 |
| Black-tailed Godwit | *Limosa limosa* | M | SL | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1600 | 160 |
| Caspian Tern | *Hydroprogne caspia* | M | SL | 7 | 1 | 23 | 1 | 3 | 0 | 7 | 0 | NA | NA |
| Common Greenshank | *Tringa nebularia* | M | SL | 4 | 1 | 1 | 16 | 2 | 0 | 2 | 0 | 1100 | 110 |
| Common Sandpiper | *Actitis hypoleucos* | M | SL | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1900 | 190 |
| Crested Tern | *Thalasseus bergii* | M | SL | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 3 | NA | NA |
| Grey Plover | *Pluvialis squatarola* | M | SL | 0 | 1 | 0 | 8 | 0 | 15 | 0 | 10 | 800 | 80 |
| Grey-tailed Tattler | *Tringa brevipes* | M | SL | 9 | 0 | 11 | 0 | 5 | 0 | 3 | 1 | 700 | 70 |
| Gull-billed Tern | *Gelochelidon nilotica* | M | SL | 0 | 0 | 5 | 5 | 0 | 1 | 5 | 2 | NA | NA |
| Little Tern | *Sternula albifrons* | M | SL | 1 | 70 | 15 | 51 | 0 | 0 | 0 | 0 | NA | NA |
| Red-necked Stint | *Calidris ruficollis* | M | SL | 0 | 55 | 88 | 65 | 40 | 0 | 570 | 0 | 4750 | 475 |
| Sharp-tailed Sandpiper | *Calidris acuminata* | M | SL | 15 | 49 | 9 | 0 | 20 | 0 | 50 | 0 | 850 | 85 |
| Terek Sandpiper | *Xenus cinereus* | M | SL | 1 | 0 | 4 | 0 | 2 | 0 | 3 | 0 | 500 | 50 |
| Whimbrel | *Numenius phaeopus* | M | SL | 9 | 80 | 11 | 139 | 2 | 65 | 7 | 181 | 650 | 65 |
| Beach Stone Curlew | *Esacus magnirostris* | - | V | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | NA | NA |
| **MIGRATORY BIRD SPECIES ABUNDANCE** | | | | 63 | 910 | 207 | 1813 | 105 | 1876 | 804 | 1711 | NA | 2000 |
| **MIGRATORY BIRD SPECIES RICHNESS** | | | | 8 | 12 | 10 | 13 | 9 | 7 | 11 | 8 | NA | 15 |
| **THREATENED & MIGRATORY BIRD SPECIES RICHNESS** | | | | 9 | 12 | 11 | 13 | 10 | 7 | 12 | 8 | NA | NA |

[A] Port of Townsville comprises the following count areas: Rock Wall, Eastern Reclamation Area, Marine Precinct and South Townsville Beach (**Figure 2**).

[B] Status according to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and Queensland *Nature Conservation Act* 1994 (NC Act): Critically Endangered (CE), Endangered (E), Vulnerable (V), Near Threatened (NT), Migratory (M), Special Least Concern (SLC), Least Concern (LC), Non-native species (I).

[C] Significance thresholds with reference to DoEE (2017) and Hansen *et al.* (2016). NA = Not available.

[D] Shaded cells indicate counts that exceed thresholds for national significance.

**Table 5: Proportion of local Threatened and Migratory bird population recorded at high tide on Port of Townsville land[A] and on the sand spit during the 2019/20 survey period**

| Count month | Port of Townsville count areas[A] | | | | Sand spit |
|---|---|---|---|---|---|
| | STB | MP | ER | RW | |
| November 2019 | <1% | 2% | 4% | <1% | 93% |
| December 2019 | <1% | 3% | 7% | 1% | 90% |
| January 2020 | 0% | 1% | 5% | <1% | 95% |
| February 2020 | 0% | 15% | 17% | 0% | 68% |
| **Average** | **<1%** | **5%** | **8%** | **<1%** | **86%** |

[A] Port of Townsville comprises the following count areas: Rock Wall (RW), Eastern Reclamation Area (ER), Marine Precinct (MP) and South Townsville Beach (STB) (**Figure 2**).

### 4.2.3 Habitats and use patterns

#### Overview

The terrestrial habitats within the developed section of the PoT study area are man-made and created by land reclamation. The fill material used in the reclamation areas includes marine sediments obtained during dredging for the PoT. Land reclamation is a gradual process and the PoT contains areas at various stages of reclamation. For example, the Eastern Reclamation Area contains areas at, or approaching, final ground surface levels as well as areas just below final levels. Therefore, the lower lying habitats within the reclamation area are transitional habitats and the use of these areas by birds will change throughout the reclamation process.

Eight general habitat types, listed below, are identifiable within the study area.

- Habitats within the developed sections of PoT:
  - rock wall and adjacent marine waters
  - artificial wetlands
  - active work areas
  - raised ground – mostly vegetated
  - raised ground – mostly bare.
- Habitats immediately adjacent to the developed sections of PoT:
  - estuarine and marine coastal waters
  - intertidal banks
  - sand spit.

When the count areas were first established by NRA (2012), they each contained one predominant habitat type. Some count areas now contain multiple habitat types due to progression in the land reclamation process. The habitat types present in the count areas of the developed sections of PoT land are summarised in **Table 6**, with descriptions of each habitat type provided below.

**Table 6: Dominant (D) and minor (m) habitat types present in bird count areas of the developed sections of PoT**

| Count area [A] | Habitat types | | | | |
|---|---|---|---|---|---|
| | Rock wall & marine waters | Artificial wetlands | Active work areas | Raised ground – mostly vegetated | Raised ground – mostly bare |
| RW6–RW9 | D | | | | |
| ER1 | | m | D | | |
| ER2 | | m | D | | |
| ER3 | | D | | m | |
| ER4 | | m | | D | |
| ER5 | | D | | | |
| ER6 | | D | | | |
| MP1 | m | m | | | D |
| MP2 | m | D | | m | |

[A] Port of Townsville comprises the following count areas: Rock Wall (RW), Eastern Reclamation Area (ER), Marine Precinct (MP) and South Townsville Beach (STB) (**Figure 2**).

### Rock wall and adjacent marine waters

The rock wall contains irregularly shaped boulders placed together to form a wall. As previously described, the seaward edge of the rock wall provides favourable habitat for molluscs and crustaceans, which are a food source for a variety of coastal bird species. The rock wall may also be used as perches for hunting, feeding and resting. These built structures provide similar habitats to naturally occurring rocky headlands and foreshores. The marine waters adjacent to the rock wall contain a range of prey species for waterbirds, notably members of the Laridae family.

During the survey period, T&M bird activity along the rock walls of the Eastern Reclamation Area was limited to a single Grey-tailed Tattler in January 2020. T&M bird species activity was more frequent along the rock walls of the Marine Precinct, with small numbers (11–21 birds) of Grey-tailed Tattler, Common Greenshank (*Tringa nebularia*), Terek Sandpiper (*Xenus cinereus*), Common Sandpiper and Whimbrel roosting there during each high tide survey.

### Artificial wetlands

ER5 and ER6 are evaporation and settling ponds for dredge material from maintenance dredging operations around PoT. The presence and volume of water in these areas varies according to dredging operations and weather (rainfall and evaporation rates), though these sites typically hold shallow and/or deep water for most of the year. There are no aquatic macrophytes, and sparse vegetation (mostly saltmarsh and small exotic grasses and forbs) occurs along the fringes of the ponds. A variety of waterbirds were observed roosting, resting and feeding at these sites (*eg* Australian Pelican, Pacific Black Duck, Plumed Whistling Duck, Black-winged Stilt, Grey Teal and Caspian Tern[5]). Caspian Tern (maximum 19 birds in December 2019) and Sharp-tailed Sandpiper (maximum 15 birds in November 2019 and January 2020) were generally the most abundant Migratory-listed species.

Following sustained rainfall, shallow pools or ponding temporarily occurs in small sections of ER4, ER2, ER1 and MP1, and cover most of ER3 and MP2. In the absence of rainfall,

[5] Australian Pelican (*Pelecanus conspicillatus*), Pacific Black Duck (*Anas superciliosa*), Plumed Whistling Duck (*Dendrocygna eytoni*), Black-winged Stilt (*Himantopus himantopus*), Grey Teal (*Anas gracilis*) and Caspian Tern (*Hydroprogne caspia*).

these sites are dry. ER3 and MP2 are lower lying and tend to hold water for longer periods (weeks to months) than ER4, ER2, ER1 and MP1 (days to weeks). Saltmarsh communities fringe ER3 and MP2, though are sparse at the other sites. Bird activity at all these sites corresponds with the presence of water, with lower bird activity when dry and higher activity when wet. When ER3 contained water, small numbers of waterfowl (*eg* Black Duck and Plumed Whistling Duck), Sharp-tailed Sandpiper and Black-winged Stilt were observed foraging and/or resting at this site; Black-winged Stilt nests (with eggs) were observed along the fringes of the waterline in February 2020 (**Plate 1**). Large numbers of Greater Sand Plover and/or Red-necked Stint roosted in MP2, ER1 and ER2 when they contained water (**Plate 2**). Only small numbers of birds ever used MP1.

**Plate 1: Black-winged Stilt nest with egg recorded in ER2 in February 2020**

**Plate 2: Mixed-species flock of shorebirds, predominantly Red-necked Stint and Greater Sand Plover, roosting in ER1 in February 2020**

## Active work areas

ER1 and ER2 are at, or close to, final ground levels. ER2 is mostly covered by an office area (demountable buildings and car park). Sections of ER1 contain rock stockpiles associated with the CU project. Anthropogenic activities influence bird usage of these sites. Red-capped Plover

(*Charadrius ruficapillus*) frequent these areas, including the car park. Greater Sand-plover, Lesser Sand-plover and Red-necked Stint occasionally roost amongst the lower stockpiles and rubble in ER1 (**Plate 2**), and in similar situations in the south-eastern corner of ER4.

### Raised ground – mostly vegetated

This habitat covers ER4 and small parts of ER3 and MP2. ER4, which is the best example of this habitat type, is one of the highest elevation areas in the study area. ER4 supports a sparse to dense coverage of native and exotic grasses and forbs, interspersed with bare patches and saltmarsh in the lower lying areas.

This habitat is mostly used by ground-dwelling specialist bird species, *eg* Golden-headed Cisticola (*Cisticola exilis*) and Australian Pipit (*Anthus novaeseelandiae*) and birds that hunt on the wing, *eg* Nankeen Kestrel (*Falco cenchroides*) and Welcome Swallow (*Hirundo neoxena*). Many of the ground-dwelling specialist birds often breed in grasslands. No T&M birds were observed using this habitat.

### Raised ground – mostly bare

This is the dominant habitat of MP1. The habitat comprises a dredge spoil stockpile that is mostly devoid of vegetative cover.

The only birds frequently recorded using this site was a pair of Beach Stone Curlews; they were recorded using it a roosting/resting area, though they may also nest there. Pied Oystercatcher and Red-capped Plover were recorded nesting there in 2019 (NRA 2019).

### Estuarine and marine coastal waters

This habitat type refers to the inshore waters immediately adjacent to the PoT land. The marine waters adjacent to the rock wall were used infrequently and by very small numbers of birds; mainly Little Tern.

### Intertidal banks/flats

Intertidal banks/flats (mud and sand with some areas of dense mangrove) occur along the northern and southern banks of the Ross River mouth and to the south in Cleveland Bay. These intertidal areas are predominantly used by shorebirds that forage at low tide. The only intertidal area surveyed during the current study was the section of Lot 773 on SP223346 between the Marine Precinct and Benwell Road, *ie* sites STB1a to STB1c (**Figure 2**). STB1c and STB1b are mostly covered by mangrove forest. This forest coverage reduces its suitability as foraging habitat for T&M shorebirds. T&M shorebirds were present in very small numbers in count areas STB1a to STB1c, with their activity concentrated along small sections of unvegetated mud flats.

### Sand spit

Suitable roost sites are critical for the persistence of shorebirds in an area. During high tides, shorebirds congregate in mixed-species groups at their roost. The sand spit in the Ross River mouth is approximately 1.8 km long, and the western extent of this sand spit submerges during the highest spring high tides. Most birds congregate at the eastern end of the sand spit, though large numbers occasionally roost at the western end. The size of the sand spit allows birds to move to different parts of the spit when disturbed. Monthly totals of T&M birds roosting at this site ranged between 910 and 1876 birds.

# 5. Discussion

## 5.1 Summary of results

T&M birds continue to use PoT during the spring and summer months, primarily at high tide when they are roosting. Foraging was rarely observed, suggesting the T&M birds using PoT acquire most of their sustenance from sites external to PoT. During the November 2019 to February 2020 survey period, the observed species richness of T&M birds (all species) at high tide on PoT ranged between nine and 12 species, and abundances ranged between 65 and 806 individuals. The smaller shorebird species were most abundant, with the Migratory Red-necked Stint present in nationally significant abundances during the February 2020 survey.

## 5.2 Comparison with previous survey results

### 5.2.1 Context: factors influencing Threatened and Migratory bird presence on Port of Townsville

An objective of the current study is to report on changes to shorebird roosting and foraging on PoT occurring as a consequence of CU project construction activities. Repeated counts across a season provide a means for comparing annual changes in T&M bird presence. Attributing any observed changes in T&M bird presence to a specific causal factor(s) is challenging, and firstly requires an appreciation of the main factors influencing their presence.

T&M bird species composition and abundance on PoT is influenced by site-specific conditions and external factors. External factors include the likely continued decline of the EAA flyway shorebird population and changes in the condition of shorebird habitats in the local area. As described in Clemens *et al.* (2016), factors outside of Australia are primarily responsible for the declines reported for the EAA flyway shorebird population. There is insufficient fine-scale data on global shorebird populations to determine the degree to which global population trends may affect the results reported for PoT.

Habitats in the local area are changing, though the full impact of these changes on the dynamics of local bird population (*eg* local abundance and areas used) is difficult to quantify. For example, the dimensions of the sand spit at the Ross River mouth changed following heavy rainfall and flooding in February 2019. This change reduced shorebird roosting on the western extent of the sand spit and increased roosting on the eastern extent. Certain shorebird groups have slightly different preferences with regard to roost site selection, and it is not clear if the changes to the sand spit had other, more subtle, impacts on the dynamics of the local shorebird population.

Changes to local shorebird habitats have also occurred in response to the construction of the Townsville Marine Precinct (2011/12) and the bridge over Ross River (2012), with impacts occurring directly via habitat loss and potentially indirectly via changes to sediment movement and local geomorphology. Soon after, and potentially in response to changes in local geomorphology caused by these developments, mangroves expanded their distribution on the southern and northern banks of the river mouth. Most shorebird species present in the local population prefer to forage in open, un-forested, areas. The mangrove expansion has therefore reduced the area and/or quality of available foraging habitat for the local shorebird population, and it is difficult to quantify the impact of these changed conditions on local population dynamics.

The site-specific conditions that will influence T&M bird presence on PoT include factors related to Port activities (including the CU project) and weather. Of these factors, the changes in habitat that will occur as land reclamation and development progresses will have the greatest and most enduring impact on T&M shorebird presence[6]. Construction activity may also impact birds by disrupting their normal patterns of behaviour; however, the impact will be limited to the construction period or activity (*ie* short-term) and will vary according each species' sensitivity to the construction-associated stimuli. For example, Eastern Curlew and Whimbrels are very sensitive to human presence and may vacate areas in response to relatively low levels of disturbance, whereas Greater Sand Plover, Lesser Sand Plover and Red-necked Stint are far more tolerant and observed on the PoT land (Eastern Reclamation Area) despite the presence of heavy machinery.

Extreme weather events such as cyclones have the potential to impact T&M birds and influence their presence in the local area. Because many of these species are migratory, a cyclone anywhere along the Queensland coastline may have an effect. Impacts may include disruption to normal migration patterns and the loss of individuals. As discussed in the following section, more ambient weather conditions may also influence shorebird presence on PoT.

### 5.2.2 Changes in Threatened and Migratory bird presence on Port of Townsville

The abundance of T&M birds on PoT during the current and previous studies is shown in **Table 7**, and is summarised in **Graphs 2** to **4**. **Graph 2** uses data from survey events where bird counts were made at high and low tides and represents shorebird presence on PoT across a daily cycle. The results show that on average fewer T&M birds used PoT in the 2019/20 season than in previous years; however, T&M bird abundance in the 2019/20 season was within the range of the abundances recorded previously. This inter-year comparison should be interpreted while bearing in mind the differences in survey timing and survey effort.

The habitats present on PoT during the 2019/20 season were similar to those that existed in the 2018/19 season, though markedly different to those that existed in the 2011/12 season. The land reclamation process had progressed substantially between 2011 and 2018, and consequently the extent of land supporting shallow water, where shorebirds may forage, had greatly reduced in the intervening period. This change has reduced T&M bird presence on PoT at low tide (**Graph 3**), and contributed to the lower T&M bird abundances across the daily cycle (**Graph 2**). The 2019/20 results and 2018/19 results for low tide are comparable (**Graph 3**), suggesting the CU project has not negatively impacted T&M bird presence on PoT at low tide.

**Graph 4** uses data from high tide surveys and represents T&M bird presence on PoT when intertidal areas are not available for foraging and most shorebirds are at their roost site. T&M shorebirds continue to roost on PoT, occasionally in appreciable abundance, though on average in lower numbers than in previous seasons (**Graph 4**). The lower abundances in the 2019/20 season compared with the 2011/12 season may in part be due to the changes in habitats on PoT, though the habitat changes do not explain the apparent decline between the 2018/19 and 2019/20 seasons. It is also unlikely that construction activity, and its impact on shorebird behaviours, was responsible for the lower abundances. While construction activity around the Eastern Reclamation Area was higher in 2019/20 than previous years, the activity

[6] Noting the area started as unsuitable habitat for shorebirds (open water) and has become suitable to varying degrees during the land reclamation process.

was restricted to relatively small areas and is unlikely to have caused birds to move away en masse. Therefore, activities associated with the CU project are likely to have had, at most, a minor influence on the apparent decline in T&M bird abundance at high tide between the 2018/19 and 2019/20 seasons.

Red-necked Stint, Sharp-tailed Sandpiper and Sand Plover (Greater and Lesser) are the T&M bird species that have consistently occurred in highest numbers on PoT at high tide. The local population of these species has declined substantially across the three study periods (**Table 8** and **Graph 5**) with the exception of Greater Sand Plover, which has apparently increased in abundance[7]. The reasons for this decline are uncertain, and both location-specific and external factors may be involved. The overall decline in these species has contributed to the lower numbers observed on PoT at high tide in the 2019/20 season.

Rainfall is also influencing the abundance of T&M birds on PoT. **Graph 5** shows that peaks in T&M shorebird abundance on PoT coincide with large rainfall events, though the relationship is not linear, with shorebirds apparently using PoT in higher numbers when rainfall exceeds certain threshold quantities. Rogers *et* al (2006) found that roost site selection by Great Knot was influenced by proximity to foraging grounds and micro-climate, with birds preferring nearby roosts where they could stand on cool, wet substrates. It is likely that Red-necked Stint, Sharp-tailed Sandpiper and Sand Plover (Greater and Lesser) have similar preferences, meaning PoT provides suitable roost habitat for these species only under specific rainfall conditions.

## 5.3 Monitoring program review and future considerations

The sampling intensity implemented in this baseline assessment is generally consistent with the minimum effort recommended by DoEE (2017) for determining the presence of 'important habitat'; *ie* four surveys for roosting shorebirds during the period when the majority of shorebirds are present in the area. DoEE (2017) recognises that replicate surveys over this period are important to measure population variability, and that in most cases one survey in December, two surveys in January, and one survey in February will be adequate. However, measuring local scale population changes at some locations, *ie* the Ross River mouth, where shorebird populations may vary substantially daily or weekly (NRA 2008, 2019), requires higher intensity sampling.

Application of the sampling intensity recommended by NRA (2019)[8] during the construction period, together with general observations, will allow for detection of gross scale changes in, or impacts concerning, the T&M bird population using PoT. However, the ability to decipher finer scale impacts from the natural background variation will be limited.

The current study has confirmed the limited value of low tide surveys, and the continuation of a reduced effort at low tide is recommended. The recommended low tide survey effort is one survey each in November, January and February. The current study has also demonstrated the importance of the high tide survey in February, with Red-necked Stint occurring on PoT in nationally significant abundance in February 2020. It is recommended that high tide surveys in February continue as part of the monitoring program.

[7] Local population abundance is based on counts made at high tide at the Ross River mouth sand spit and on PoT.

[8] The survey regime recommended by NRA (2019) is reflected in the project scope of this current assessment.

**Table 7: Abundance of Threatened and Migratory birds recorded on PoT during the spring and summer months of 2011/12 (NRA 2012), 2018/19 (NRA 2019) and 2019/20 (this study)[A]**

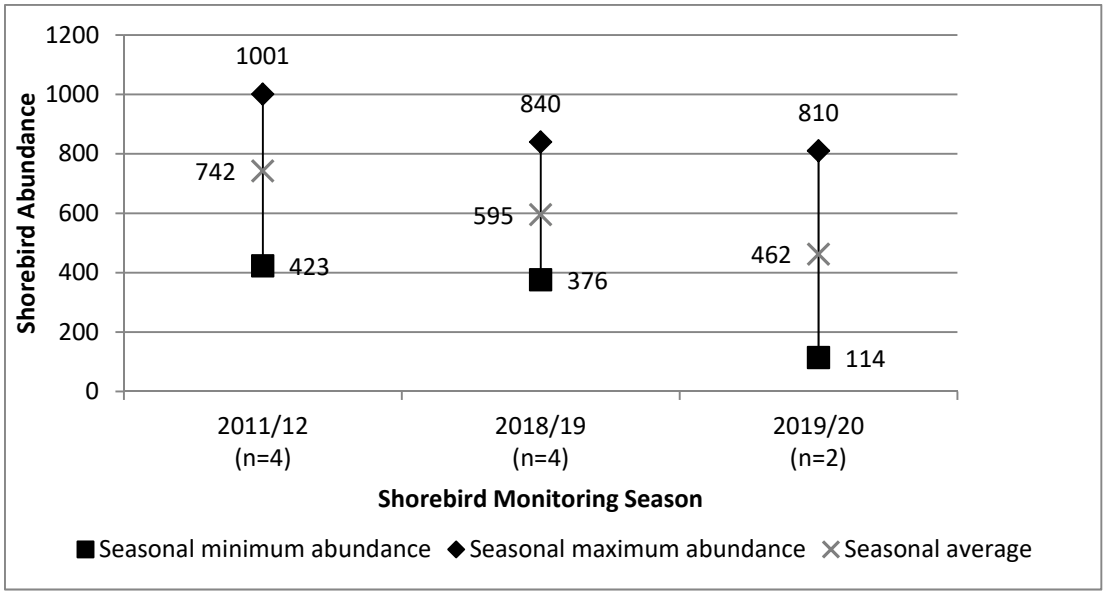
| Survey season | Survey month | | | | | | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|
| | October | November | November | November | December | January | February | | |
| 2011/12 (NRA 2012) | NA | 552 (222/330) | - (85/-) | - (-/312) | 423 (104/319) | 993 (885/108) | 1001 (895/106) | 2969 (2191/1175) | 742 (438/235) |
| 2018/19 (NRA 2019) | 564 (556/8) | 600 (589/11) | NA | NA | 840 (836/4) | 376 (360/16) | NA | 2380 (2341/39) | 595 (585/10) |
| 2019/20 (this report) | NA | - (63/-) | NA | NA | - (207/-) | 114 (105/9) | 810 (804/6) | 924 (1179/15) | 462 (295/8) |

[A] Total abundance is provided with high and low tide results in parenthesis. 'NA' = months where survey data is not available because no survey was conducted in that month. For some months only a high or low tide survey was conducted; the '-' symbol denotes the absence of a corresponding estimate.

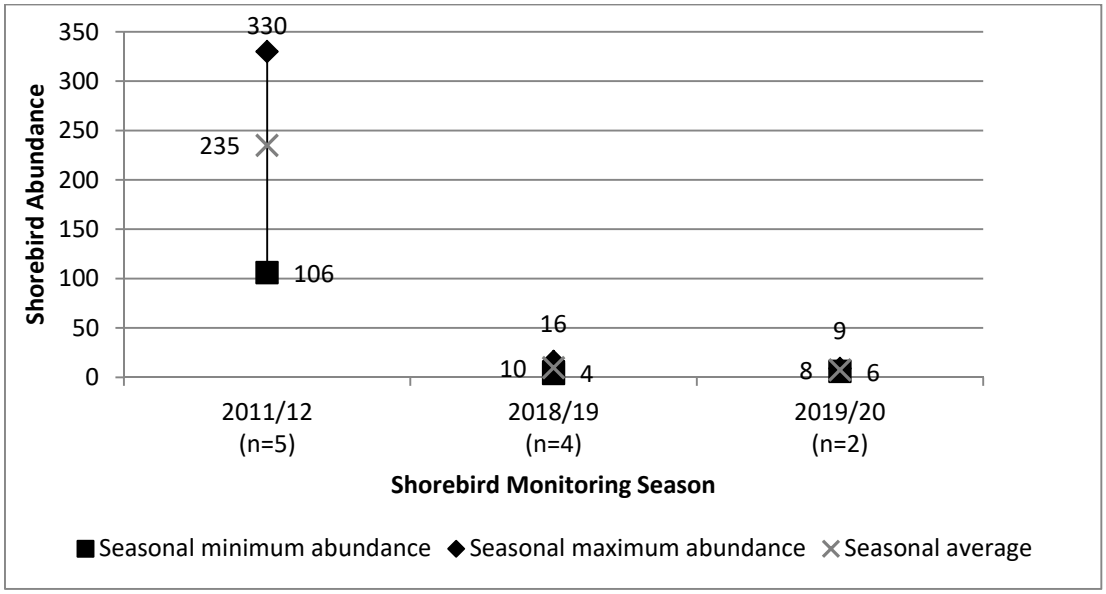
**Table 8: Local population abundance[A] of the main Threatened and Migratory bird species that occur on Port of Townsville**

| Common name | Status | | Average species abundance (minimum – maximum) | | |
|---|---|---|---|---|---|
| | EPBC Act | NC Act | 2011/12 (NRA 2012) | 2018/19 (NRA 2019) | 2019/20 (this report) |
| Red-necked Stint | M | SLC | 681 (509–848) | 398 (10–695) | 205 (40–570) |
| Sharp-tailed Sandpiper | M | SLC | 157 (92–326) | 169 (42–314) | 36 (9–64) |
| Greater Sand Plover | V, M | V | 90 (21–200) | 139 (5–274) | 183 (30–350) |
| Lesser Sand Plover | E, M | E | 133 (62–242) | 47 (0–115) | 25 (0–60) |

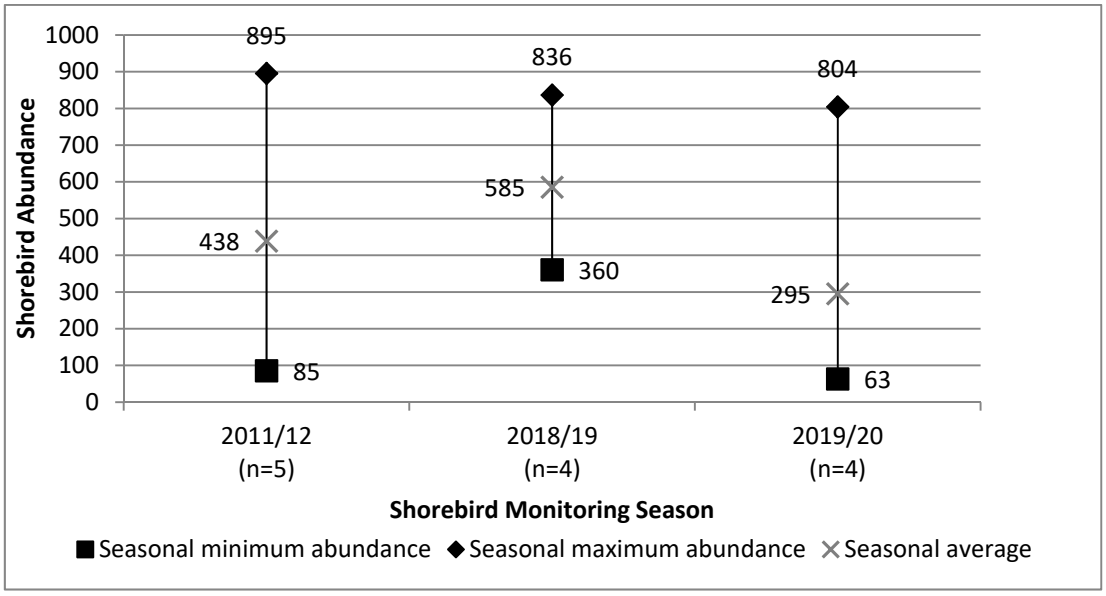
[A] Local population abundance is based on counts made at high tide at the Ross River mouth sand spit and on PoT.



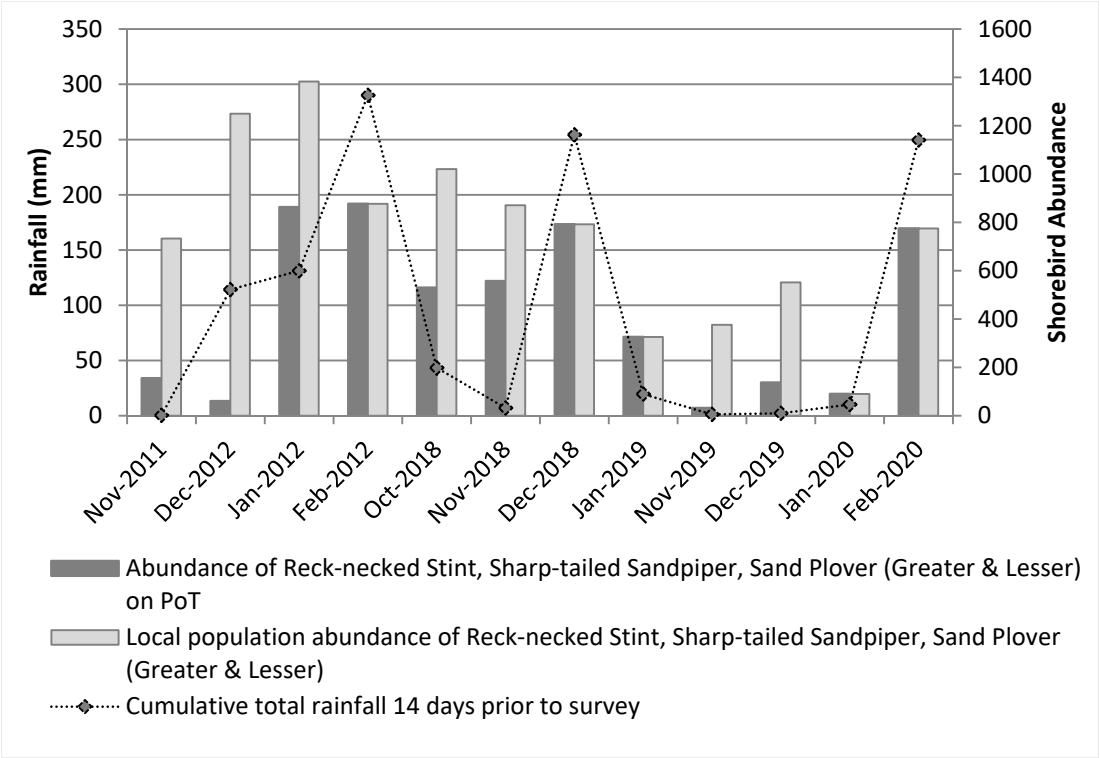

**Graph 2: Abundance of Threatened and Migratory birds on Port of Townsville from survey events involving counts at high and low tides (*ie* across a daily cycle)**




**Graph 3: Abundance of Threatened and Migratory birds on Port of Townsville at low tide**




**Graph 4: Abundance of Threatened and Migratory birds on Port of Townsville at high tide**




**Graph 5: Abundance of the main Threatened and Migratory bird species that roost on Port of Townsville at high tide in relation to local population size and rainfall**

# 6. Conclusion

T&M shorebirds continue to use PoT during the spring and summer months, primarily as a high tide roost site and mostly after sustained rainfall. Foraging was rarely observed, suggesting the T&M shorebirds using PoT acquire most of their sustenance from sites external to PoT.

The abundance of T&M shorebirds using PoT in 2019/20 season was less than in previous seasons (2011/12 and 2018/19). The apparent decline between 2018/19 and 2019/20 was primarily due to fewer T&M shorebirds using PoT at high tide. The decline is attributable to external factors; activities associated with the CU project are likely to have, at most, a minor impact. While the abundance of T&M shorebirds on PoT has decreased, the Migratory Red-necked Stint was recorded in nationally significant numbers in February 2020, providing evidence that the CU project is not having major impact.

It is recommended that the 2020/21 monitoring event involve monthly surveys at high tide between October and February, with additional low tide surveys in January and February. The general survey approach and locations should, as far as practical, replicate those implemented for the 2019/20 study.

# 7. References

BOM 2020, *Weather data for Townsville Aero (Station 032040)*, Bureau of Meteorology, accessed 13 March 2020.

Clemens, RS, Rogers, DI, Hansen, BD, Gosbell, K, Minton, CDT, Straw, P, Bamford, M, Woehler, EJ, Milton, DA, Weston, MA, Venables, B, Weller, DR, Hassell, C, Rutherford, B, Onton, K, Herrod, A, Studds, CE, Choi, CY, Dhanjal-Adams, KL, Murray, NJ, Skilleter, G, & Fuller, RA 2016, 'Continental-scale decreases in shorebird populations in Australia', *Emu* 116: 119–135.

DoEE 2017, *EPBC Act policy statement 3.21, Industry Guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebird Species*, Commonwealth Department of Environment and Energy.

Driscoll, P 1997, 'The distribution of waders along the Queensland coastline', in P Shaw (ed), *Shorebird Conservation in the Asia-Pacific Region*, The Australasian Wader Studies Group of Birds Australia.

Driscoll, P 2009, *Avifauna Assessment Report for Marine Precinct EIS*, Port of Townsville Limited, Prepared for GHD Australia, April 2009.

Geering, A, Agnew, L & Harding, S 2007, *Shorebirds of Australia*, CSIRO Publishing, Australia.

Hansen, BD, Fuller, RA, Watkins, D, Rogers, DI, Clemens, RS, Newman, M, Woehler, EJ, & Weller, DR 2016, *Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species*, unpublished report for Department of the Environment, BirdLife Australia, Melbourne.

NRA 2005, *Townsville Port Access Project: Migratory Bird Impact Assessment,* prepared for Queensland Department of Transport and Main Roads, December 2005.

NRA 2008, *Use Patterns of the Ross River Mouth by Migratory Birds*, prepared for Maunsell Australia Pty Ltd, February 2008.

NRA 2012, *Avifauna Survey for the Townsville Port Expansion Project November 2011 to February 2012*, prepared for AECOM, April 2012.

NRA 2019, *Baseline Shorebird Monitoring Study for the Townsville Port Expansion Project October 2018 to January 2019*, R02 (Final), prepared by NRA Environmental Consultants for Port of Townsville Limited, 2 May 2019.

NRA 2020, *Townsville Eastern Access Rail Corridor, Threatened and Migratory Coastal Bird Survey Report (2019/20)*, R01, prepared by NRA Environmental Consultants for Queensland Department of Transport and Main Roads, 30 March 2020.

Pell, S & Lawler, W 1996, *Queensland Wader Survey: Wader Communities along the North-East Queensland Coast (Bowen to Cairns)*, prepared on behalf of Queensland Ornithological Society Inc. for Queensland Department of Environment and Heritage, February 1996.

Port 2019, *Townsville Port Expansion Channel Upgrade Project Shorebird Monitoring Plan*, Port of Townsville Limited, August 2019.

Rogers, DI Battley, PF Piersma, T Van Gils, JA & Rogers, KG 2006, 'High-tide habitat choice: insights from modelling root selection by shorebirds around a tropical bay', *Assoc. Study Anim. Behav.* 72(3): 563–575.

# Appendix A:
# Site Plan for CU Project Capital Dredging Activities (Source: Port of Townsville Limited)

## Figure 3: Site Plan for CU Project Capital Dredging Activities

*Environmental Approval & Compliance Solutions*

**Cairns Office:**
Level 1, 320 Sheridan Street, PO Box 5678 Cairns QLD 4870
**P: 61 7 4034 5300**

**Townsville Office:**
Suite 2A, Level 1, 41 Denham Street, PO Box 539 Townsville QLD 4810
**P: 61 7 4796 9444**

**www.natres.com.au • nra@natres.com.au**

Natural Resource Assessments Pty Ltd trading as NRA Environmental Consultants. ABN: 77 011 073 135
Certified Integrated Management System: AS/NZS ISO 9001:2015 (Quality), AS/NZS ISO 14001:2015 (Environment), AS/NZS 4801:2001 (Safety).