

Western Basin Dredging and Disposal Project (EPBC 2009/4904)

Environmental Performance Report December 2019

For the attention of: The Department of the Environment and Energy



Cover photos: *Top Row:* Wildlife Unlimited Pty Ltd 2019, Chartrand et al 2019.
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Acronyms

BPAR	Benthic Photosynthetically Active Radiation
CCL	Curved Carapace Length
DoEE	Department of the Environment and Energy (formerly known as the Department of Environment (DoE))
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPR	Environmental Performance Report
ERMP	Ecosystem Research and Monitoring Program
ERMPAP	Ecosystem Research and Monitoring Program Advisory Panel
GPC	Gladstone Ports Corporation
ToR	Terms of Reference
WBDDP	Western Basin Dredging and Disposal Project
WBRA	Western Basin Reclamation Area
WQMP	Water Quality Management Plan

Executive Summary

The 2019 Environmental Performance Report (EPR) has been prepared to comply with the following conditions of the Western Basin Dredging and Disposal Project (WBDDP) *Environmental Protection and Biodiversity Conservation Act (EPBC Act) Approval 2009/4904:*

Condition 36

Ecosystem and Research Monitoring Program (ERMP)

The person taking the action must submit to the Minister an Annual Environmental Performance Report covering the following topics:

- a) Dolphins, dugong and marine turtles, and other megafauna;*
- b) Migratory shorebirds; and*
- c) Seagrass.*

Condition 37

ERMP

12 Months from the date of approval, a report must be submitted outlining the initial environmental activities for the 12 month period. The report is to be called the Environmental Performance Report and must be submitted within 42 days of the 12 month activity period. The Environmental Performance Report must include proposed environmental management improvements to be implemented through the DCMP, WQMP and other Plans as relevant. Reports are required annually from thereafter.

The 2019 EPR covers the period from 1 November 2018 to 31 October 2019 and includes the outcomes of the studies conducted under the ERMP. The report also provides an overview of the seagrass monitoring program being conducted as a compliance requirement under the post dredging phase of the WBDDP Water Quality Management Plan (WQMP).

Information presented in this report has been collated from the project reports submitted by the service providers and approved by the ERMP Advisory Panel (ERMPAP). A copy of all approved final reports received in the current period will be published on the Gladstone Ports Corporation's (GPC's) ERMP webpage. Interim reports are not published on the website.

Status updates on the following key monitoring programs pertaining to Condition 36 are being reported:

Health impacts of organochlorines and trace elements in Australian humpback and Australian snubfin dolphins in the Port of Gladstone - A desktop study.

This report provides a review of organochlorine and trace element concentrations in Australian humpback and Australian snubfin dolphins in the Port of Gladstone and Port Alma. Adverse effects of contaminants in dolphin species are also discussed and recommendations for further toxicological assessments in the dolphin populations in the Port of Gladstone are provided.

Monitoring of Australian humpback dolphins at Agnes Water to investigate distribution and movement patterns adjacent to the Gladstone Ports Corporation ERMP study area.

Funding is being provided to a PhD student studying the population dynamics of dolphins in Agnes Water. The funding under the ERMP will be used to assess whether dolphins in Agnes Water are a part of resident population or belong to population from the Port of Gladstone. A report is expected in early 2020.

Increase understanding of dugong ecology and habitat use in Port Curtis, including Rodds Bay - opportunistic tagging of dugongs in Port Curtis.

Whilst not a necessary requirement due to small population numbers, opportunistic tagging of dugongs is carried out and sightings within Port Curtis are noted. This section details any further recordings of dugongs in 2018-2019.

Study on the cause and health condition of beached dugong.

Following the report of a beached dugong on 19 September 2019, field necropsy was conducted and tissue samples collected for histopathology, organic pollutants and trace element concentration in tissues. The report for this study is expected in December 2019.

Marine turtle nesting populations: Avoid, Peak and Curtis Island Flatback Turtles.

Surveys for monitoring nesting success under the ERMP at Avoid and Peak Islands started in 2013 and at Curtis Island from 2015.

A two week mid-season census was conducted at all the three islands in 2018-2019. The nesting flatback turtle population at each island showed normal demographic features for the Eastern Australian flatback stock in terms of female size, clutch size, egg size and hatchling size.

Increase the Understanding of the Green Turtle Population in Port Curtis

This study commenced in 2015 with the first field survey conducted in 2016 and came to an end in October 2019. Field surveys were undertaken in April, May, June, August and October 2019. The annual report for the 2018 fieldwork was received within this reporting period and observations from the 2018 report are being included in the current EPR. Findings from the 2019 surveys will be documented in the 2020 EPR along with a comprehensive report showing the trends from the four-year long program.

Comprehensive survey of the migratory shorebirds.

Comprehensive monitoring of migratory shorebirds was conducted in 2011 and 2012 and recommenced in 2019 as required under the EPBC Act approval. Five (5) surveys in January, February (summer), March (northern migration), August (winter) and October (southern migration) were conducted across a maximum of 154 sites from Port Curtis, Fitzroy Estuary (Port Alma), Mundoolin Rocks/Colosseum Inlet, Mainland Shoreline, Rodds Peninsula, and North Curtis (Keppel Creek & Yellowpatch Sandbar). Preliminary observations show that the number of shorebirds are within the range of normal variability. The annual report providing details of all observations is expected in December 2019.

Monitoring the survival and recovery of shorelines, specifically tidal wetlands (mangroves/saltmarsh/salt pans)

Aerial mapping and boat-based surveys of mangroves in Port Alma, Port Curtis and Rodds Bay was conducted in April/ May 2019. The 2018-2019 Annual report was finalised in August 2019. The data being collected is also being used for developing scores for mangrove health

to be included in an annual report card produced by the Gladstone Healthy Harbour Partnership (GHHP).

The following seagrass study was conducted in accordance with the WBDDP Water Quality Management Plan (WQMP) and was not funded under the ERMP:

Annual long term monitoring of seagrass

Long-term mapping of seagrass in Port Curtis and Rodds Bay continued from 2002. In the current reporting period, annual mapping of seagrass occurred in November 2018.

In 2018, the overall condition of seagrasses in Port Curtis and Rodds Bay was satisfactory. This was a substantial improvement following three years of consistently poor conditions. In particular, the largest meadow in Rodds Bay has returned to good condition for the first time in a decade.

The ERMP Synthesis Report

The ERMPAP has recommended that the findings from the 10 year ERMP is to be summed up in a report named The Synthesis Report. Workshops have been held in the current reporting period to define the scope of the synthesis report and Panel members have commenced working on each section of the ERMP report.

Upcoming projects approved by the ERMPAP

The following studies have been approved by the ERMPAP and will be conducted in 2020 and 2021:

- Assessment of toxicological status of Australian humpback and Australian snubfin dolphins in Port Curtis and Port Alma
- Assessing the impact of dredging operations on megafauna in the Port of Gladstone
- Assessing the impact of reclamation activities on migratory shorebirds at the Western Basin Reclamation Area

Environmental approvals and management plans

No amendments to any of the approvals or management plans were made during this reporting period.

1.0 Introduction

1.1 Project Overview

To facilitate the significant development of the Port of Gladstone, GPC obtained approvals from the State and Commonwealth Government in 2010 to extend, deepen and widen existing shipping channels and create new berth facilities through the WBDDP. Stage 1A of the Project commenced on 20 May 2011 and was completed on 18 September 2013. This involved dredging of 22.5 million m³ of seabed material that was placed at sea (5.1 million m³) and within the Western Basin Reclamation Area WBRA (17.4 million m³). The WBDDP was subject to substantial environmental monitoring (water quality, seagrass, Benthic Photosynthetically Active Radiation (BPAR), marine megafauna, shorebirds, tidal wetlands etc.) as required under the various approval conditions. Post completion of dredging activities, a number of environmental monitoring programs are still in progress and will continue till 2021.

1.2 Ecosystem Research and Monitoring Program

The EPBC Act approval 2009/4904 required the development, implementation and funding of a Port Curtis and Port Alma ERMP (Condition 27 to 33), overseen by an Advisory Panel (the ERMPAP) and headed by an Independent Chair (Conditions 25 and 26). The ERMP requires research commitments relating to marine megafauna (Conditions 33a to 33f), migratory shorebirds (33g to 33k), seagrass and other marine communities (Conditions 33l to 33m).

The ERMP was structured to execute projects through a tiered approach. Tier one programs comprised desktop reviews to collate existing information and identify gaps in knowledge pertaining to the ERMP area. Appendix 1 shows the boundary of the ERMP area. Tier two projects consisted of on-ground monitoring programs designed to comply with conditioned requirements of the EPBC Act approval. The ERMP also has provisions for Tier three projects required in response to unforeseen events or following an emergency situation.

The Terms of Reference (ToR) for the ERMPAP have been developed and approved by the Department of Environment and Energy (DoEE). The ERMPAP ToR outline the roles of the ERMPAP as well as the processes for project development including tender selection and review and approval of project reports. The ToR were last amended in 2016. The outcomes and findings of the ERMP have been reported in the annual EPRs (CQG Consulting 2011, 2012 and 2013, GPC EPR 2014, 2015, 2016 and 2017). The ERMP, ERMPAP ToR and EPRs are available on the GPC's website (link below).

<http://www.gpcl.com.au/environment/ermp>

1.3 Environmental Performance Report

EPRs have been prepared to comply with the following conditions of the WBDDP EPBC Act Approval 2009/4904:

Condition 36

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- a) Dolphins, dugong and marine turtles, and other megafauna;*
- b) Migratory shorebirds; and*
- c) Seagrass.*

Condition 37

12 Months from the date of approval, a report must be submitted outlining the initial environmental activities for the 12 month period. The report is to be called the Environmental Performance Report and must be submitted within 42 days of the 12 month activity period. The Environmental Performance Report must include proposed environmental management improvements to be implemented through the DCMP, WQMP and other Plans as relevant. Reports are required Annually from thereafter.

To date, eight reports (CQG Consulting 2011, 2012, 2013, GPC EPR 2014, 2015, 2016 2017 and 2018) covering the period from 22 October 2010 to 31 October 2018 have been submitted DoEE.

The 2019 EPR is the ninth report and, as required under the approval conditions, discusses the outcomes of the monitoring programs pertaining to marine megafauna (dolphins, dugongs and marine turtles), migratory shorebirds, seagrass and tidal wetlands that were conducted from 1 November 2018 to 31 October 2019. A list of all reports generated in the current reporting period and approved by the ERMPAP is appended (Appendix 2). The objectives of the proposed projects have also been outlined in this report. A timeline of the ERMP has been attached (Appendix 3) to this report.

Information on seagrass monitoring as required under the WBDDP WQMP (outside the ERMP funding) has also been added to this report, in addition to an overview of the ERMPAP meetings conducted during the reporting period and an update on the status of the WBDDP approvals and management plans.

2.0 Progress of the ERMP in 2018-2019

2.1 Marine Megafauna

2.1.1 Dolphins

2.1.1.1 A desktop study to advise on the research to estimate the health impacts of organochlorines and heavy metals in Australian humpback dolphins in Port Curtis

Overview

The objective of this desktop study was to understand how further toxicological analysis could be conducted to improve the interpretation of effects of the contaminants (organochlorines and heavy metals) on the health status of the Australian humpback and Australian snubfin dolphins in Port Curtis, Port Alma and Rodds Bay survey areas.

Findings

The report focussed on the exposure pathways of contaminants in dolphins, contaminant levels and comparison on a global scale, correlations between contaminant concentration and effect and the ecological risk assessments. The study reviewed the outcomes from the toxicological analysis of Australian humpback and Australian snubfin dolphins conducted under the ERMP between 2014 and 2015. Analysis of biopsy samples from 17 Australian humpback and 18 Australian snubfin dolphins revealed that levels of contaminants in both species were higher in Port Alma as compared to the Port of Gladstone. The report highlighted that the primary exposure to contaminants was through intake of food. Age and sex of the dolphin could affect the levels of the contaminants with males showing higher levels compared to females. High levels of persistent organic pollutants have been linked to high rates of infertility and inhibited ovulation. Other impacts include immunosuppression leading to increased susceptibility to pathogens. The report further stated that information pertaining to chemical exposure in Australian dolphin species is limited and no information on toxicity threshold in Australian dolphin species exists. To better understand the health impacts of contaminants in dolphins the following were recommended:

- Continued monitoring of contaminants in dolphin skin biopsies and carcasses, including consideration of major flooding or dredging activities, to identify changes in chemical exposure over time.
- The application of ecological risk assessments - to provide important information on the likelihood of adverse effects occurring at current and future contaminant exposures.
- Development and application of *in vitro* (cell-based) toxicity bioassays - to provide species-specific data on the effects of contaminants in dolphins and improve risk assessments.
- Toxicokinetic-toxicodynamic modelling - to develop better understanding of exposure and effects at the organism and population levels.
- Further development of biomarkers of chemical exposure and effect - to provide tools for early detection of chemical exposure.

2.1.1.2 Monitoring of Australian humpback dolphins at Agnes Water to investigate distribution and movement patterns adjacent to the Gladstone Ports Corporation ERMP study area

Overview

The ERMPAP recommended partially funding the study to understand whether the Australian humpback dolphins in the Agnes Water area were resident population or exhibited movements and connectivity with the Australian humpback dolphins in the Port of Gladstone.

Specifically, the study aims to:

- a) Use Dr Daniele Cagnazzi's Port Curtis database for comparison against the photographic ID catalogue to determine if the habitat and range of the Port Curtis dolphins extends beyond the ERMP study area.
- b) Improve the current state of knowledge of inshore dolphins and their interactions with key habitats and port developments to facilitate adaptive management as the port continues to develop into the future.
- c) Increase an understanding of the status and movement patterns of Australian humpback dolphins in the Port Curtis area

Fieldwork for this study is scheduled for October and November 2019 and the project report will be provided in March 2020.

2.1.2 Dugongs

2.1.2.1 Increase understanding of dugong ecology and habitat use in Port Curtis, including Rodds Bay - opportunistic tagging of dugongs in Port Curtis

Overview

Opportunistic tagging of dugongs is being undertaken to gain information on the movement of dugongs in the Port Curtis region. The study commenced in 2014 on an opportunistic basis during the health assessment studies of green turtles and came to an end in 2019.

Findings

Two dugongs were tagged in 2014 and one in 2015. No dugongs could be tagged in 2016 due to unfavourable underwater visibility. In 2017, dugongs were sighted close to Pelican Banks during green turtle health assessment surveys, but none were encountered at locations where they could be tagged. In 2018 and 2019, no dugongs could be tagged due to high water turbidity, though sightings of dugongs occurred adjacent to Wild Cattle Island and at Rodds Bay (Figure 1).

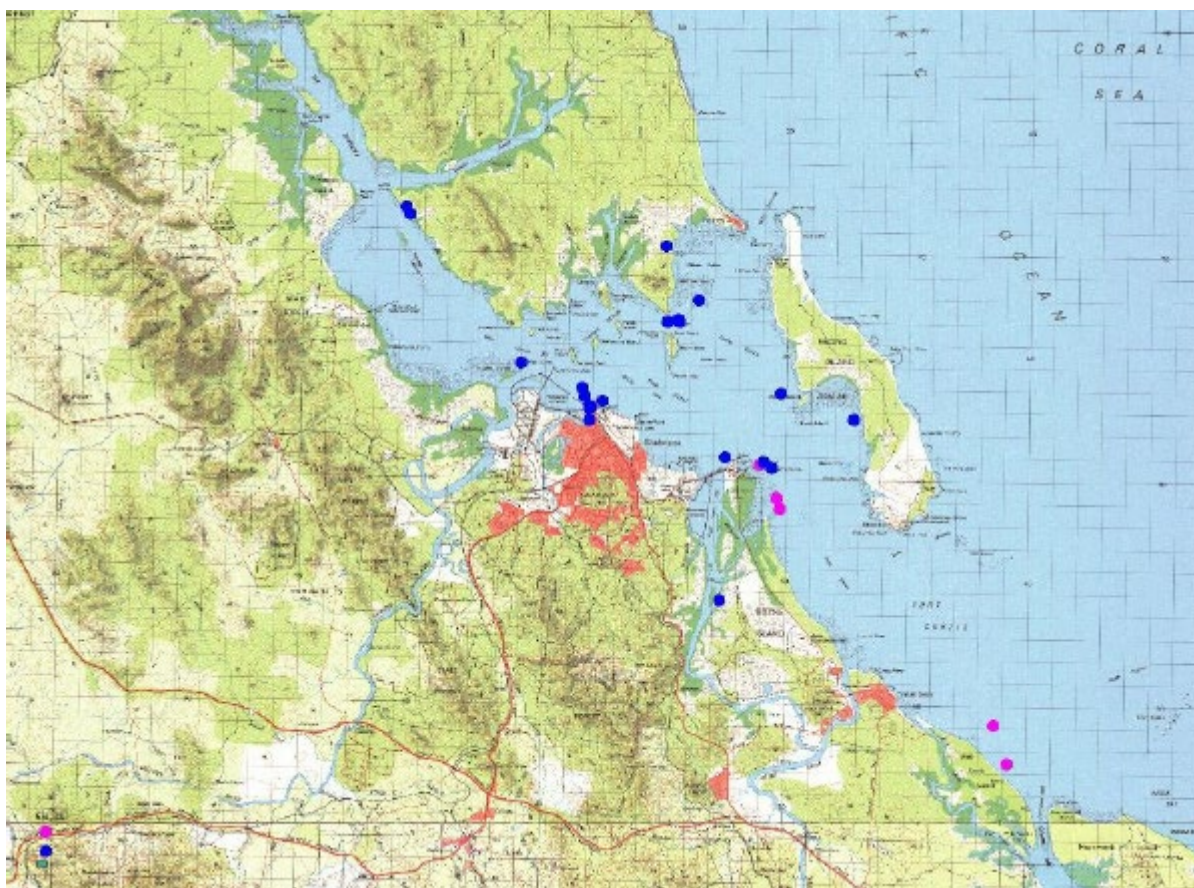


Figure 1: Locations where marine mammals were observed in 2018, blue dots represent Australian humpback dolphins and mauve dots denote dugongs.

The ERMPAP has advised that due to the small population of dugongs in the study area, targeted investigations on habitat usage by dugongs is not necessary. Ancillary sightings of dugongs during other projects can be recorded to provide information on the dugong population in and around the Port of Gladstone.

[2.1.2.2 Study on the cause and health condition of beached dugong](#)

The ERMPAP recommended that an investigation into the health condition and possible cause of death of a beached dugong, sighted on 19 September 2019, be conducted under the ERMP. Field necropsy was conducted as soon as the carcass was collected.

Tissue samples were collected for the following analyses:

- Histopathology
- Organic pollutant concentrations in tissues
- Trace element concentrations in tissues
- Skin tissue to conduct genetic analysis
- Stomach contents to analyse diet
- Skull with teeth for ageing

The report for this study is expected in December 2019.

2.1.3 Marine Turtles

2.1.3.1 Marine Turtle Nesting Populations: Avoid, Peak and Curtis Island – Flatback Turtles

Overview

Studies are being conducted on Avoid, Peak and Curtis Islands to monitor the Eastern Australian flatback turtle nesting population. During 2018-19, a two-week mid-season census was conducted on all three islands from 24 November to 7 December 2018. At Curtis Island, daily monitoring was conducted from 24 November to 14 December 2018 and included the standard mid-season census period.

Findings

In the 2018 nesting census, a total of 30 individual nesting flatback turtles and 30 clutches of eggs were recorded at Curtis Island during the two-week census period (24 November–7 December 2018). A total of 122 individual nesting flatback turtles and 113 clutches of eggs were recorded at Peak Island during the two-week nesting period census. At Avoid Island during the mid-season census period a total of 29 individual flatback turtles and 31 clutches were recorded. Over the entire census period, 181 individual flatback turtles and 176 clutches were recorded. A summary of observations at all three islands for 2018-2019 is presented in Table 1.

Nesting populations on Curtis Island during the two-week mid-census period has approximately halved during the past decade although, the recruitment of new adults into the nesting population has been increasing at a low rate over the same period. Peak Island nesting populations may still be declining at a slow rate across the last 11 breeding seasons. Avoid Island census counts were considerably lower in the current season in comparison to the previous six seasons.

Hatching success of eggs exceeded 80% across all nests throughout the season on Curtis Island, 73% on Peak Island and 59% for Avoid Island.

Monitoring of the nesting flatback turtles on Curtis, Avoid and Peak islands will continue under the ERMP for another season in 2019-2020.

Table 1: Summary of data collected on flatback turtles, nesting at three index rookeries, Curtis, Peak and Avoid Islands, during the mid-season census period: 24 November to 7 December 2018.

Data Collected	Curtis Island	Peak Island	Avoid Island
# turtles – total	30	122	29
Mean tracks/night ± SD	2.6 ± 2.1	17.5 ± 9.52	3.5 ± 4.5
# clutches – total	30	114	32
Nesting success	75.0%	48.3%	65.3%
New recruits to breeding population	16.0%	10.8%	17.2%
Female CCL (cm)	94.3 ± 1.6; n = 25	93.5 ± 2.8; n = 116	93.2 ± 2.5; n = 28

Mean remigration interval (yr)	3.4 ± 1.1; n = 20	3.3 ± 1.7; n = 108	3.0 ± 1.4; n = 24
Mean eggs/clutch	52.1 ± 8.76; n = 31	51.6 ± 8.1; n = 29	n.a.
Mean egg diameter (cm); n = # clutches	5.18 ± 0.14; n = 28	5.2 ± 0.11; n = 250 (25 clutches)	n.a.
Mean egg weight (g); n = # clutches	77.0 ± 5.59 n = 28	76.8 ± 7.2; n = 250 (25 clutches)	n.a.
Incubation duration from census nests; n = # clutches	48.4 ± 1.8; n = 14	51.2 ± 3.0; n = 16	49.8 ± 3.3; n = 17
Hatching success; n = # clutches	86.7 ± 14.9%; n = 14	82.8 ± 12.53%; n = 16	61.4 ± 36.5%; n = 15
Emergence success; n = # clutches	81.8 ± 20.2%; n = 31	73.3 ± 19.8%; n = 16	59.6 ± 35.5%; n = 15

2.1.3.2 Increase the Understanding of the Green Turtle Population in Port Curtis

Overview

This study commenced in 2015 with the first field survey conducted in 2016 and came to an end in October 2019. The aim of this study was to obtain information on the size, sex, maturity, growth rates, survivorship, recruitment and general health of the green turtle population in Port Curtis and the Narrows. The 2018 annual report was approved by the ERMPAP in 2019.

In 2019, five field trips were conducted in April, May, June, August and October. The report for the 2019 monitoring period will be finalised in 2020. Additionally a comprehensive report will be produced in 2020 analysing the trends and findings from the four-year long program.

Findings

The observations from the 2018 annual report is being included in this EPR. A total of 500 green turtles were captured during the 2018 surveys with 457 being individual turtles and 43 turtles being recaptured on more than one occasion during 2018. Turtles were captured consistently across most sites with the majority captured between the Pelican Banks (25%), South Trees (28%), Boyne Estuary and mouth (24%) followed by the Boyne River Estuary (20%). Other captures were made at Facing Island, Quoin Island, Western Basin and Wild Cattle Island. A total of 1120 sightings of green turtles were recorded in the Port Curtis area during 2018.

Typical of turtles found in Eastern Queensland foraging areas, the sex ratio is biased toward female turtles and both juvenile and adult turtles were present. Juvenile turtles were common in shallow intertidal areas around mangroves or rocky reef during the high tide level whilst larger turtles were captured in deeper inter-tidal and sub-tidal waters. Close to where the juvenile turtles were captured, larger turtles were also present in adjacent deeper waters, however they were not easily captured using the turtle rodeo method. Approximately 7% of adult female and male turtles were estimated to have prepared for the 2018-2019 breeding season.

Similar to findings from 2017, variability in diet was observed in turtles captured from different sites.

GPS satellite telemetry tracking of five (5) turtles showed that none of the turtles made use of the shipping channels or the port infrastructure. Intermittent movement between the port and open waters was observed.

Australian humpback dolphins were observed at multiple locations in Auckland Creek and dugongs in the southern part of the Port of Gladstone. No dugongs were encountered in a situation where they could be captured.

A summary of observations from the 2018 survey is presented in Table 2.



Table 2: Summary of tagging history of green turtles captured in Port Curtis and adjacent waterways for 2018.

Month	Pelican Banks			Quoin Island			Facing Island			Western Basin & The Narrows			South Trees			Boyne River mouth & Wild Cattle Is flats			Boyne River: Benaraby & South Trees Inlet			TOTAL
	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	New tagging	recapture from PC (within year recapture)	Migration recapture from a breeding area	
2018																						
April	15	1	-	-	-	-	-	-	-	-	-	-	-	-	-	44	17 (7)	2	5	-	-	84 (7)
May	57	21 (3)	1	6	-	-	6	6	-	8	0 (1)	-	22	0 (1)	-	11	5 (5)	-	4	-	-	147 (10)
June	5	3 (1)	-	2	-	-	5	2	-	1	-	-	66	-	-	9	2 (8)	-	-	-	-	95 (9)
August	-	-	-	-	-	-	-	-	-	-	-	-	14	0 (3)	-	2	-	-	-	-	-	42 (4)
October	10	4 (2)	-	3	0 (1)	-	2	0 (1)	-	8	-	-	34	0 (7)	-	6	0 (2)	-	1	-	-	89 (13)
TOTAL	87	29 (6)	1	11	0 (1)	-	13	8 (1)	-	17	0 (1)	-	136	0 (11)	-	72	24 (22)	2	10	-	-	457 (43)
																46	0 (1)	1				



2.2 Migratory Shorebirds

2.2.1 Comprehensive Survey of the Migratory Shorebirds in 2019

Overview

Throughout 2019, a total of five (5) comprehensive surveys were completed for recording abundance estimates of migratory shorebirds. These comprehensive surveys have replaced the previous single annual summer surveys which commenced in 2013 in accordance with the conditions of the EPBC Act Approval Condition 33(i), which states “Single Annual Summer Surveys (October-March) covering the major high tide roost sites from years three to eight with a repeat of the comprehensive surveys during years nine and ten”. As a continuation of this, five surveys will also be conducted in 2020 to mark year ten.

Findings

The first shorebird survey was carried out from the 6-10 January 2019 to represent early summer. A total of 152 roosts were surveyed at Port Curtis, Fitzroy Estuary, North Curtis, Mundoolin-Colosseum, Rodds Peninsula and the Mainland Shoreline and Cheetham Salt Works. A total of 11,666 migratory shorebirds were recorded during this time, ten (10) percent lower than 2018 and six (6) percent lower than the summer average. During this time, 18 different species were identified in comparison to 19 species identified in 2018.

Results throughout February 2019 (late summer conducted from 5 to 9 February 2019) showed a further decline in migratory shorebirds. A total of 10,566 migratory shorebirds were recorded from 154 roosts, an 18.5 percent decrease in comparison to 2018 and 15 percent less than the summer average. Similar to January, 18 different species were identified. Low numbers of Red-necked Stints were recorded which may be due to their opportunistic feeding behaviour on coastal wetlands rather than occupying their roosts. This may have contributed to overall low numbers.

From the 7-11 March 2019, a survey was conducted to represent the northern migration of shorebirds. A total of 145 roosts were surveyed with 12,361 migratory shorebirds and 924 non-migratory shorebirds recorded. The bird counts were slightly higher in 2019 compared to similar survey in 2012. Curtis Island Yellow Patch Sandbar had the largest roost of 2,274 migratory shorebirds.

An overwintering/non-breeding survey was carried out from 1-6 August 2019. A total of 3460 shorebirds were recorded; 2416 migratory and 1046 non-migratory from 153 roosts. In August 2012, there were 5403 shorebirds recorded, 4764 migratory shorebirds and 639 resident shorebirds.

Monitoring of shorebirds during the southern migration period was conducted between 14 and 18 of October 2019. A total of 12,385 migratory shorebirds were recorded during the survey of 146 roosts. The bird counts were about 3.1% higher compared with the October 2013 monitoring, the last southern migration survey previously undertaken.

A comprehensive annual report covering all 5 (five) monitoring periods will be finalised in December 2019.

2.3 Mangroves

2.3.1 Monitoring the survival and recovery of shorelines, specifically Tidal Wetlands Mangroves / Saltmarsh / Saltpans

Overview

The aim of this program is to monitor the condition, survival and recovery of shorelines, specifically tidal wetlands, for a period spanning six (6) years. The study area throughout Port Curtis and Port Alma (PCPA) extends from Rodds Bay to Port Alma. The objectives of this study is to generate high resolution maps of tidal wetlands in the ERMP Study area through Normalised Difference Vegetation Index (NDVI) mapping of tidal wetlands; undertake shoreline condition monitoring; and launching of a public access data entry portal for display of current and past mapping. This project was approved by the ERMPAP in 2014, work commenced in mid-November 2014 and will proceed until 2021.

During 2018-2019, progress was made in four (4) major areas including: 1) extended use of previously developed mapping resources for the purposes of monitoring the condition of mangroves throughout the study area, 2) complete aerial surveys of shorelines throughout the study area, 3) extensive field surveys of sites working with the Gidarjil rangers to assist with validation of satellite data and compile descriptors of habitat conditions and 4) further development of ShoreView online display facility.

As per the previous year, additional field surveys were completed to produce the 2019 indicators of mangrove condition as part of the Annual Report Card for the GHHP.

Findings

Preliminary observations document shoreline retreat of mangroves at multiple locations throughout the study area. Causes of retreat and mapping of areas that are showing retreat will be completed in 2020.

2.4 Seagrass

2.4.1 Seagrasses in Port Curtis and Rodds Bay - Annual long term monitoring

Overview

Seagrass monitoring in the Port Curtis and Rodds Bay area began in 2002, with annual observations of ten core meadows commencing (in November each year) in 2004. Additional meadows have been added to these core meadows, along with biannual surveys of the Port Curtis and Rodds Bay areas to determine distribution during low and peak growing season and in accordance with pre, during and post dredging requirements. In the current reporting period, a total of fourteen meadows were assessed from the 4 – 10 November 2018, for changes in biomass (density), area of coverage and species composition.

A total of 1,507 sites were surveyed in the Port Curtis and Rodds Bay seagrass annual monitoring survey area in November 2018. The meadows were grouped under The Narrows (Black Swan), Grahams Creek (Upper and Lower), Western Basin (including Wiggins Island), Inner Harbour, Mid Harbour (including Pelican Banks), South Trees Inlet (lower) and Rodds Bay.

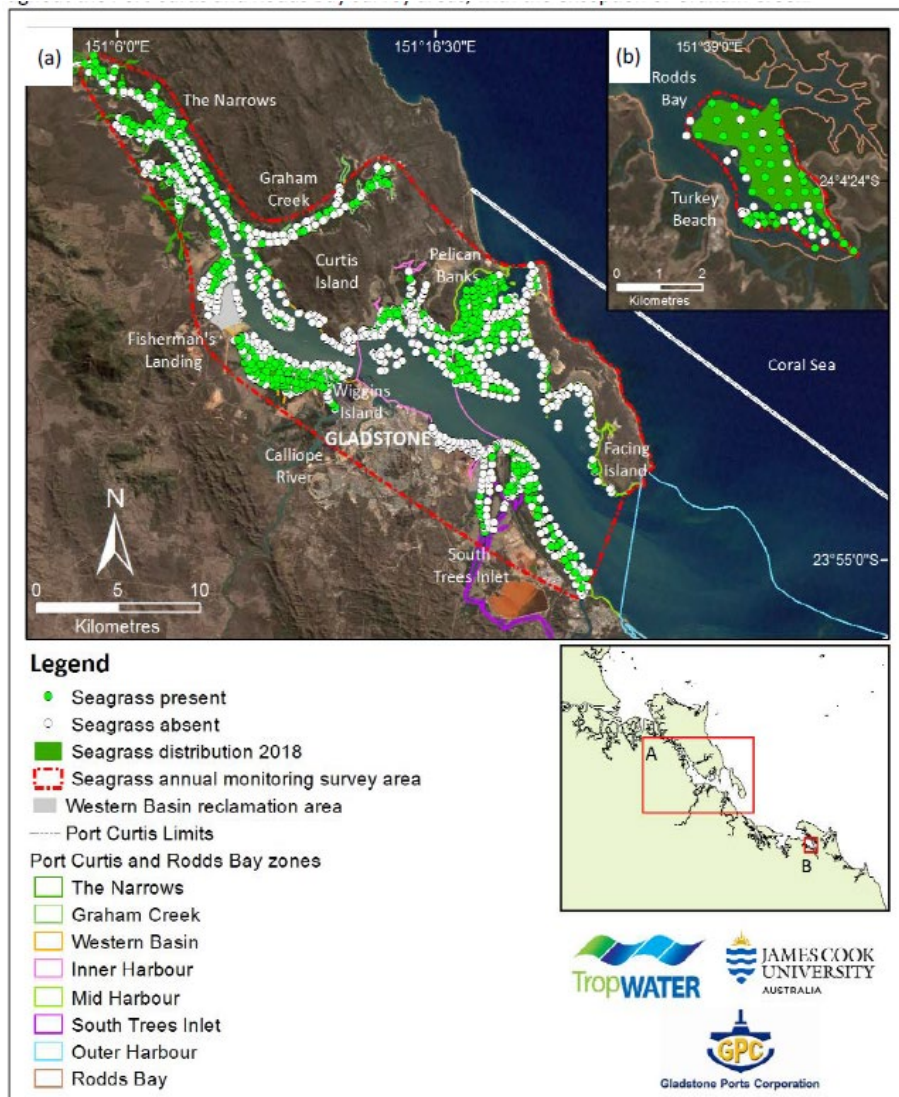


Figure 2: Seagrass presence/absence at sites surveyed during 2018.

Findings

For the second year in a row, seagrass mapped in the Port Curtis area continues to increase above the long-term average. The overall condition of seagrass in the Port Curtis and Rodds Bay area during November 2018 was satisfactory – an improvement following several years of poor condition. Ten meadows were in very good to satisfactory condition, with only four (4) remaining in poor or very poor condition. This recovery is likely due to lack of major rainfall events in 2018.

Historically, the largest and most dense seagrass meadow, Pelican Banks, remained in a poor condition during 2018. Whilst biomass and area continue to improve, the meadow is still a long way from regaining its full capacity. Given its historical importance, a continued trajectory of recovery in the future remains key to marine environmental health in Port Curtis. Research detailing the impacts of high levels of feeding from dugongs and green turtles may explain, in part, the low amounts of biomass present.

Other individual meadows either improved or remained stable in comparison with the findings from 2017. A significant improvement was made in the Rodds Bay area where biomass and area improved on all three (3) monitoring meadows, including the largest meadow which returned to good condition for the first time in a decade and one (1)

meadow doubling in size since 2017. No correlation was made between seagrass improvement and the proximity to the port, suggesting that changes in meadows are more responsive to environmental conditions rather than anthropogenic activities.

Seagrass of the Port Curtis and Rodds Bay area is generally consistent with trends along the Queensland east coast, showing signs of improvement after significant weather events of 2009 and 2010. This continued improvement has shown that seagrass are resilient and able to recover from stress. Further improvement throughout 2019 is expected with the continued lack of major rainfall events.

This was the last annual seagrass monitoring conducted under the approved WQMP for the WBDDP. Annual seagrass monitoring will continue under the Long-term Maintenance Dredging Management Plan from 2019.

2.5 The ERMP Synthesis Report

The purpose of this report is to synthesise the findings and outcomes of the ERMP that can be used to identify any potential impacts and inform adaptive management responses. The report is proposed to be conducted in three parts:

- a) History of WBDDP and ERMP
- b) Technical synthesis of science arising from ERMP
- c) Governance and management

A workshop was conducted in May 2019 to discuss the structure, framework and timeframes of the Synthesis Report. The technical synthesis of science section is currently being drafted by each subject matter expert from the ERMPAP. The report is due for completion by October 2021.

3.0 Upcoming ERMP Projects

The ERMPAP have recommended that the following projects be conducted under the ERMP between 2020 and 2021.

3.1 Assessment of toxicological status of Australian humpback and Australian snubfin dolphins in Port Curtis and Port Alma

The objective of this study will be to further improve our understanding of the toxicological status of Australian snubfin and Australian humpback dolphins in Port Curtis and Port Alma survey areas. This will be conducted by collecting biopsy samples from free ranging Australian humpback and Australian snubfin dolphins in Port Curtis and Port Alma following methodologies previously adapted for the study “Increase understanding of the status of the Australian snubfin and Australian humpback dolphins within Port Curtis and Port Alma”. Conducting analyses of heavy metals and persistent organic pollutants in biopsy samples and applying ecological risk assessment to provide important information on the likelihood of adverse effects occurring at current and future contaminant exposures. The study will also aim to monitor the variability in the concentration of the toxicants from 2010 to the current monitoring period, develop and apply *in vitro* (cell-based) toxicity bioassays to provide species-specific data on the effects of contaminants in dolphins and improve risk

assessments. The study will commence in January 2020 and will be completed by October 2021.

3.2 Assessing the impact of dredging operations on megafauna in the Port of Gladstone

The objective of the study will be to identify changes to the population and behaviour of key mega-fauna species in the Port of Gladstone during capital dredging operations. The significant marine megafauna species that have the potential to be impacted by capital dredging activities include:

- Green turtle (listed as vulnerable, migratory marine and listed marine under the EPBC Act, and vulnerable under the Nature Conservations Act)
- Loggerhead turtle (listed as endangered, migratory marine and listed marine under the EPBC Act, and endangered under the NC Act)
- Flatback turtle (listed as vulnerable, migratory marine and listed marine under the EPBC Act, and vulnerable under the NC Act)
- Dugong (listed as migratory marine and listed marine under the EPBC Act, and vulnerable under the NC Act)
- Australian humpback dolphin and Australian snubfin dolphin (listed as migratory marine under the EPBC Act, and vulnerable under the NC Act)

The proposals are currently being assessed by the ERMPAP and the project is scheduled for commencement in the first quarter of 2020.

3.3 Assessing the impact of Reclamation Activities on Migratory Shorebirds at the Western Basin Reclamation Area

The objective of the study will be to assess the impact of bund filling activities on the number of shorebirds in the WBRA. The project will involve counting of migratory shorebirds in the WBRA over the high tide period on an approximately fortnightly basis from December 2019 to August 2020. The study will follow established methods for documenting shorebird numbers including recording key project related activities (eg. filling of reclamation area, truck locations etc) during the monitoring period.

4.0 ERMPAP meeting highlights

In the current reporting period, two (2) ERMPAP meetings were held in February and May 2019. The agenda of these meetings primarily focussed on:

- Updates on results and findings of ERMP surveys and research;
- Trends and issues arising from results and findings of ERMP surveys and research;
- Further monitoring or research requirements;
- Ongoing projects and compliance with ERMP conditions;
- Resolutions for advice to GPC and subsequently DoEE; and
- ERMP budget and financial update.

A project specific ERMPAP meeting was held in October 2019, to discuss and approve the proposal received for the project “Assessment of toxicological status of Australian humpback and Australian snubfin dolphins in Port Curtis and Port Alma”.

In the current reporting period, one (1) letter of recommendation pertaining to ERMPAP governance and changes in scope of projects (dated 28 March 2019) was sent to GPC by the Chair of the ERMPAP. The letter of recommendations and GPC’s response to these recommendations was forwarded to DoEE on 5 April 2019.

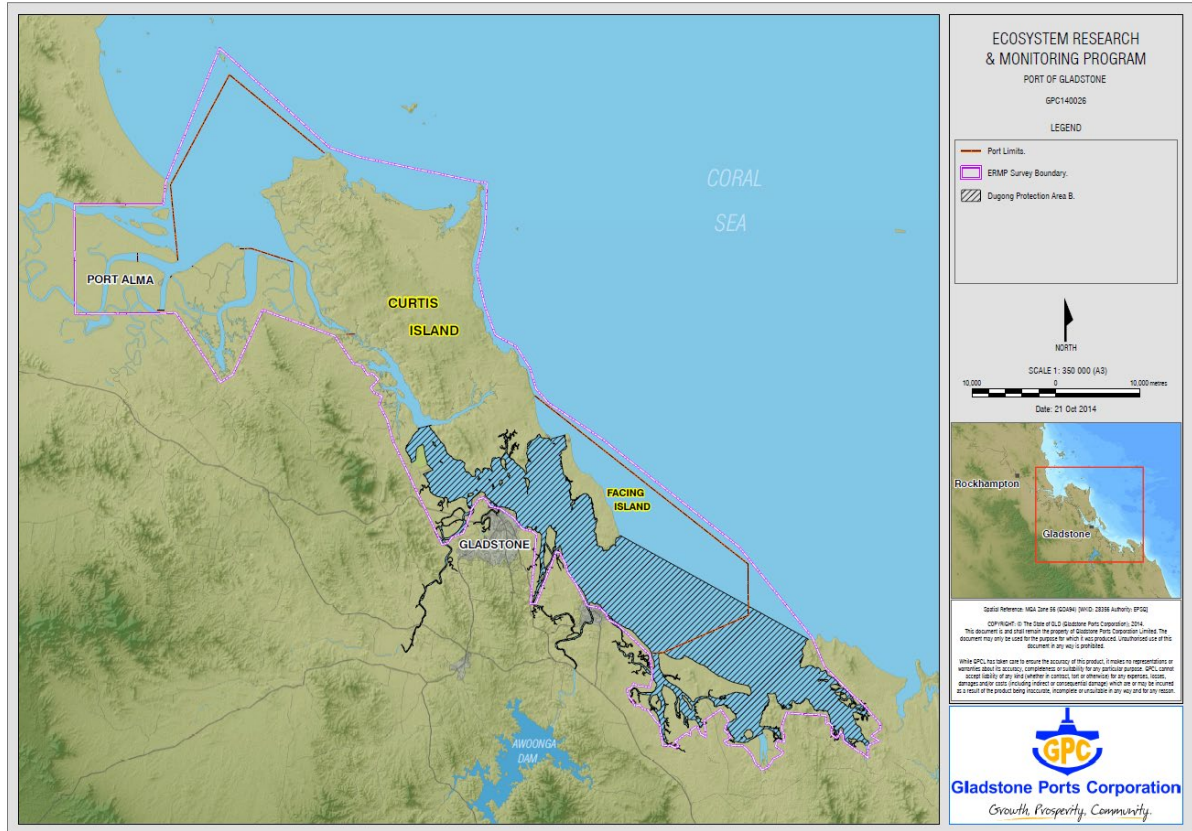
5.0 Amendment/ Revisions of Management Plans

The WBDDP Dredge Management Plan, WQMP and Flora and Fauna Management Plan continue to remain in a dormant state. Only the Acid Sulfate Soil Management Plan remains active with obligations pertaining to the on-going maintenance of the WBRA in the form of ground water monitoring and biannual inspections.

Groundwater monitoring at 28 bore wells continue on a monthly basis at the WBRA. The 2017 Annual report on groundwater monitoring was submitted to the Department of Environment and Science in February 2018.

No changes to the ERMP or the ERMPAP ToR were made in the current reporting period.

Appendix 1 Geographical boundary of the ERMP



Appendix 2 Reports Approved by the ERMPAP in 2018-2019

1. Kimberly Finlayson, Liesbeth Weijs and Jason van de Merwe (2019). Health impacts of organochlorines and trace elements in Australian humpback and Australian snubfin dolphins in the Port of Gladstone. Gold Coast: Griffith University. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 29 pp.
2. Colin J. Limpus, Nancy N. FitzSimmons, Karl French, Fiona Hoffmann, Erwin Hoffmann, Duncan J. Limpus, Maree McLaren, George McLaren, Caroline Robertson, Felicity Shapland and Trevor Turner (2019). Flatback Turtle, *Natator depressus*, 2018-2019 Breeding Season, at Curtis, Peak and Avoid Islands. Brisbane: Department of Environment and Science, Queensland Government. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 73 pp.
3. Colin J. Limpus, Nancy N. FitzSimmons, Kimberly Finlayson, Christabel Hannon, Duncan J. Limpus, Des Pursell, John M. Sergeev and Takahiro Shimada (2018). Increase the Understanding of the Green Turtle Population in Port Curtis. Brisbane: Department of Environment and Science, Queensland Government. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation Ecosystem Research and Monitoring Program. 32 pp.
4. Wildlife Unlimited Pty Ltd (2019). Gladstone Ports Corporation Report for Migratory Shorebird Monitoring, Port Curtis and the Curtis Coast Early Summer Survey – January 2019. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 5 pp.
5. Wildlife Unlimited Pty Ltd (2019). Gladstone Ports Corporation Report for Migratory Shorebird Monitoring, Port Curtis and the Curtis Coast Early Summer Survey – February 2019. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 10 pp.
6. Wildlife Unlimited Pty Ltd (2019). Gladstone Ports Corporation Report for Migratory Shorebird Monitoring, Port Curtis and the Curtis Coast Early Summer Survey – March 2019. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 5 pp.
7. Wildlife Unlimited Pty Ltd (2019). Gladstone Ports Corporation Report for Migratory Shorebird Monitoring, Port Curtis and the Curtis Coast Southern Migration - October 2019. Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 5 pp.
8. Wildlife Unlimited Pty Ltd (2019). Gladstone Ports Corporation Report for Migratory Shorebird Monitoring, Port Curtis and the Curtis Coast Overwintering/Non-Breeding – August 2019. Report produced for the Ecosystem Research and Monitoring Program

Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. 5 pp.

9. Duke N.C., Mackenzie J., Kovacs, J., Cormier, R., Eilert, F., Atkinson, I. and van der Valk, S. (2019). 2018-2019 Annual Report: Port Curtis and Port Alma Coastal Habitat Archive and Monitoring Program (PCPA CHAMP). Report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program. Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER) Publication 19/28, James Cook University, Townsville, 40 pp.

Seagrass Monitoring Studies outside the ERMP

10. Chartrand K., Wells J., Carter A., and Rasheed M. (2019). Seagrasses in Port Curtis and Rodds Bay 2018: Annual long-term monitoring. Centre for Tropical Water & Aquatic Ecosystem Research (TropWATER) Publication 19/02, James Cook University, Cairns, 63 pp.

Appendix 3 ERMP timeline

ERMP timeline	2011	2012	2013	2014	2015	2016	2017	2018	2019		2020		2021	
									Jan to June	July to Dec	Jan to June	July to Dec	Jan to June	July to Dec
<u>Projects</u>														
Baseline Studies														
Baseline Light Monitoring of Marine Turtles														
Shorebird Monitoring														
Marine Megafauna and Acoustic Monitoring														
Tier 1 gap Analysis Studies														
Central Queensland Corals and Associated Benthos: Monitoring review and gap Analysis														
Migratory Shorebird Monitoring Review														
Research, monitoring and management of seagrass ecosystems adjacent to port developments in central Queensland: Literature Review and Gap analysis														
Review of Water Quality Studies														
Review of Coastal Dolphins in Central Queensland, particularly Port Curtis and Port Alma regions														
Status of the dugong population in the Gladstone area														
Monitoring of Coastal Sea turtles Reports 1-6														
Loggerhead														
Green														
Hawksbill														
Olive Ridley														

ERMP timeline	2011	2012	2013	2014	2015	2016	2017	2018	2019		2020		2021	
									Jan to June	July to Dec	Jan to June	July to Dec	Jan to June	July to Dec
<u>Projects</u>														
Flatback														
Leatherback														
Tier 2 Projects - Ongoing														
Green Turtle population and Health study														
Monitoring Seagrass Seedbank Density and Viability within Port Curtis														
Monitoring the survival and recovery of shorelines, specifically Tidal Wetlands (Mangroves/Saltmarsh/Salt pans)														
Dugong feeding ecology and habitat use (dugong feeding trail assessment)														
Dugong tagging in collaboration with Green Turtle tagging and turtle population and health studies														
Migratory Shorebird Monitoring: Understanding Ecological Impact														
Migratory Shorebird Survey														
Dolphin Monitoring														
Turtle Nesting Populations on Curtis, Peak and Avoid Islands														
Green Turtle Satellite Telemetry														
Flatback Turtle Satellite Telemetry														
Green Turtle Blood analysis														
Monitoring of Coastal Lighting Effects on Marine Turtles – Pendoley Environment														
Aquatic Ambient Noise Monitoring – Blue Planet Marine														
Study on the cause and health condition of beached dugong														
Monitoring of Australian humpback dolphins at Agnes Water to investigate distribution and														

ERMP timeline	2011	2012	2013	2014	2015	2016	2017	2018	2019		2020		2021	
Projects									Jan to June	July to Dec	Jan to June	July to Dec	Jan to June	July to Dec
movement patterns adjacent to the Gladstone Ports Corporation ERMP study area														
ERMP Synthesis Report														
Upcoming Projects														
Assessing the impact of Reclamation Activities on Migratory Shorebirds at the Western Basin Reclamation Area														
Toxicological assessment of Australian humpback and Australian Snubfin Dolphins														
	Completed													
	In progress													