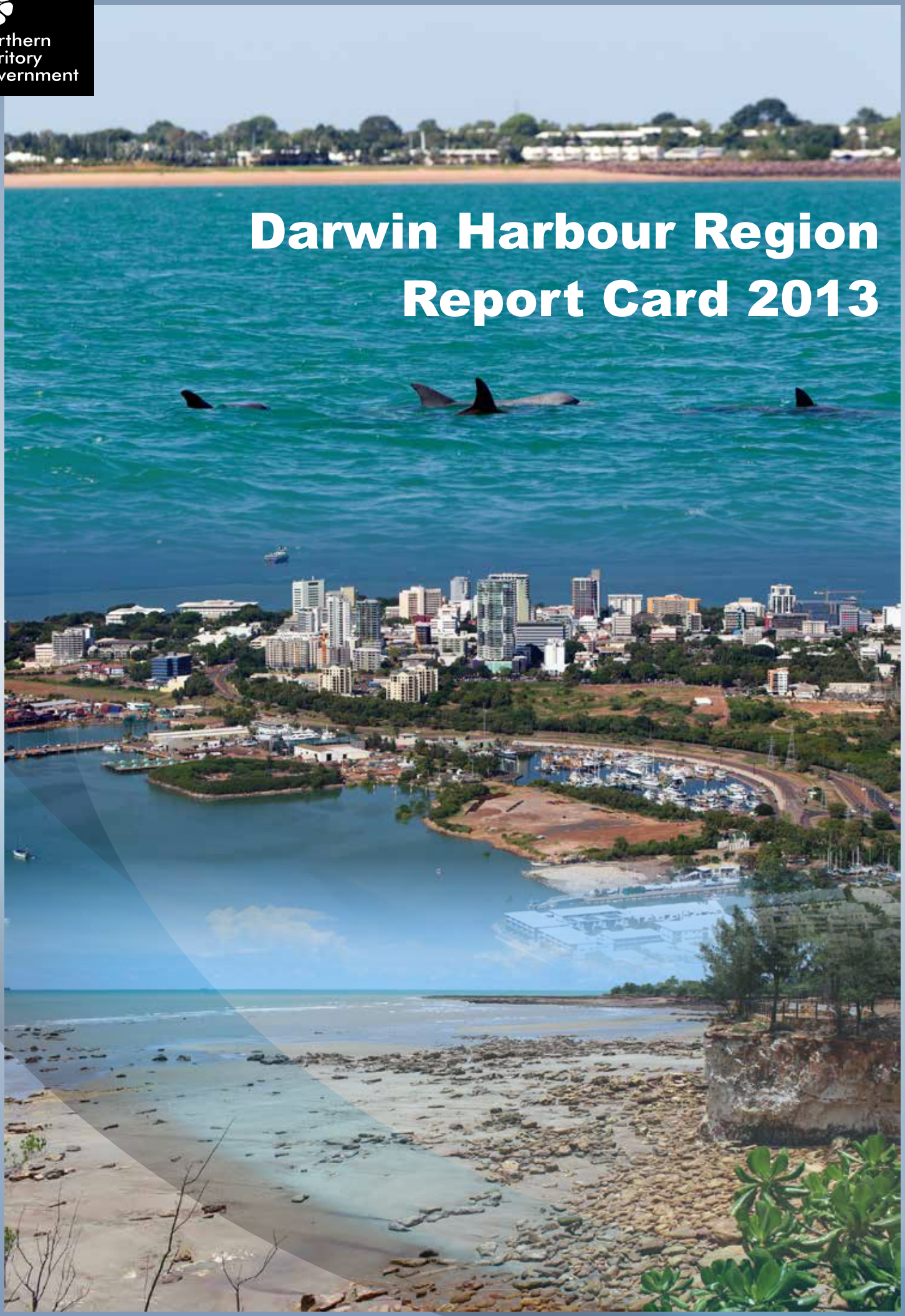
Northern Territory Government

Department of Land Resource Management

Darwin Harbour Region Report Card 2013



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Foreword

Darwin Harbour is a thriving commercial asset and a wonderful community recreational resource. With spectacular sunsets and a healthy marine ecosystem, the Harbour is enjoyed for its fishing, sailing, water sports and historical and cultural significance. It is also a pillar of our prospering tourism and maritime industries.

The water quality of Darwin Harbour has been monitored regularly since 2008 and I am pleased that once again the release of the annual report card affirms the health of the harbour is widely of good to excellent condition.

The Department of Land Resource Management (DLRM) annually collates results from a range of monitoring programs it conducts, as well as other government agencies and the private sector, to report on the overall health of Darwin Harbour. This year DLRM has expanded its monitoring programs to improve the parameters used to assess the Harbour's health, including mapping of sea floor habitats and dolphin monitoring.

Continued monitoring of our working harbour informs its management and long-term sustainability, providing for an increasingly vibrant port, premier tourism destination and recreational opportunities for all Territorians to enjoy.

The Hon. Willem Westra Van Holthe

Minister for Land Resource Management

Darwin Harbour – A Wonderful Community Asset

The Darwin Harbour Region

The Darwin Harbour Region covers 3,200 square kilometres, stretching from Gunn Point in the north, to the Darwin River Dam in the south, and across to Charles Point in the west. The region has a population of over 120,000 people and encompasses the cities of Darwin and Palmerston, the Cox Peninsula and an expanding rural area.

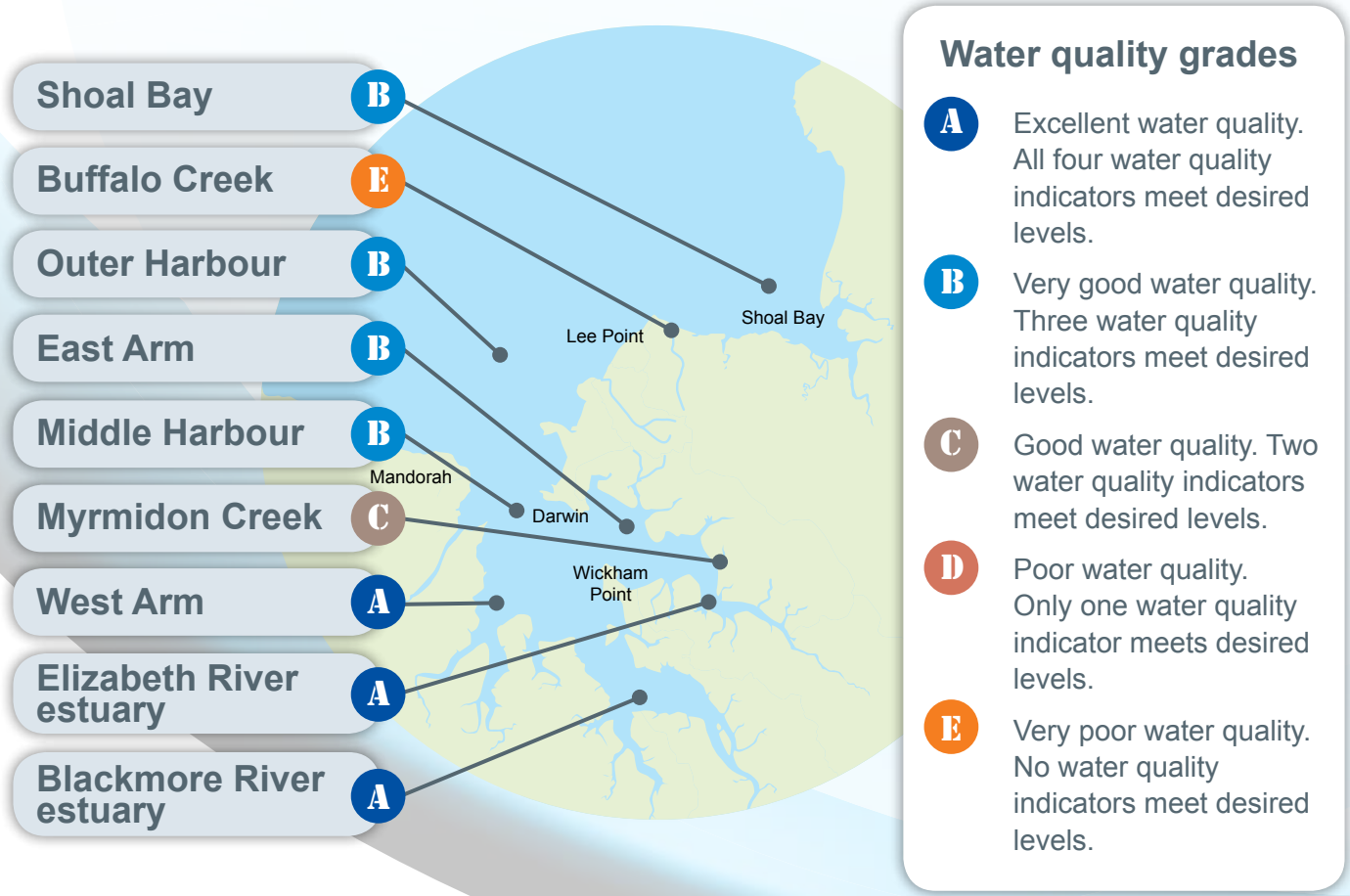
Ongoing monitoring of the harbour provides baseline information against which future change can be measured, allows trends to be assessed over time, and provides early warning of any impending changes. Monitoring also provides feedback about the effectiveness of management actions on the environment. We should recognise that the decisions we make today will substantially determine the health of our harbour in the future.

The water quality of Darwin Harbour and its catchment has been monitored regularly since 2008, and the results presented annually since 2009 as a Report Card. This report card provides a snapshot of water quality at a range of sites across the harbour. Monitoring data were collected by the Department of Land Resource Management, and PowerWater Corporation.

Further technical information supporting the Report Card is available in the publication *Darwin Harbour Water Quality: Supplement to the 2013 Darwin Harbour Region Report Card*.

The Report Card

Each region in the harbour was assessed for water quality from mid-2012 to October 2013 and assigned a grade using four indicators: water clarity, dissolved oxygen, algae and nutrients. These are explained in more detail on the next page.



Water quality grades

A Excellent water quality. All four water quality indicators meet desired levels.

B Very good water quality. Three water quality indicators meet desired levels.

C Good water quality. Two water quality indicators meet desired levels.

D Poor water quality. Only one water quality indicator meets desired levels.

E Very poor water quality. No water quality indicators meet desired levels.

Indicators used in the report card.

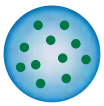
Water clarity

Plants, such as seagrasses and microscopic algae, need sunlight to grow. Clear water allows sunlight to reach these plants. Darwin Harbour has a naturally wide range of water clarity which varies over the tidal cycle, and is also affected by storm water and dredging activity.

Dissolved oxygen

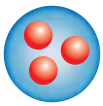
Water contains the small amounts of oxygen which are needed by aquatic animals to survive. However, storm water and wastewater from treatment plants, and the disturbance of mangrove muds by boats and the tides, can reduce oxygen concentration to potentially harmful levels. Proliferations of algae can sometimes reduce oxygen to very low levels at night.

Algae



Algae are microscopic plants which are a natural part of the ecosystem and provide food for large animals like mangrove snails and microscopic creatures such as tiny shrimps. When waters become polluted with nutrients, large amounts of algae can adversely affect the marine ecosystem.

Nutrients



Nitrogen and phosphorus are nutrients required by algae to grow. However, pollution by nutrients can produce too much algae, and adversely affect the ecosystem.

Below is a table that shows water quality indicators for each region of the harbour, with a ✔ indicating those that met the desired level (known formally as a Water Quality Objective) and a ✖ indicating those that were unsatisfactory.

The bottom of the table shows the Water Quality grades for 2013 and past years.

	Harbour region								
Indicator	Outer Harbour			Inner Harbour				Tidal creeks	
	Outer Darwin Harbour	Shoal Bay	Middle Darwin Harbour	Blackmore	East Arm	Elizabeth	West Arm	Buffalo Creek	Myrmidon Creek
Water clarity	✔	✔	✔	✔	✔	✔	✔	✖	✔
Dissolved oxygen	✖*	✖*	✖*	✔	✖*	✔	✔	✖	✖
Algae	✔	✔	✔	✔	✔	✔	✔	✖	✔
Nutrients	✔	✔	✔	✔	✔	✔	✔	✖	✖
	Report Card grades								
2013	B	B	B	A	B	A	A	E	C
2012	B	B	A	A	A	A	A	E	C
2011	A	C	A	C	A	A	A	E	-
2010	A	C	B	B	A	A	A	E	C
2009	A	C	A	B	B	C	-	E	-

* The Outer Harbour and East Arm regions had slightly higher dissolved oxygen levels than the desired levels based on the Water Quality Objectives for Darwin Harbour. However these elevated oxygen levels were natural and not harmful. This observation highlights the need to revise the dissolved oxygen Water Quality Objectives.

- no grade calculated for the year

Working Together for a Common Purpose

There are sound economic, social, cultural and ecological reasons to keep Darwin Harbour healthy, and this is our common purpose. An unhealthy harbour will become expensive to manage and restore. It will be less able to support aquaculture, tourism, recreation, and the diverse range of plants and animals that currently live in our harbour. A healthy harbour is especially important to our local Indigenous peoples.

The focus of this Report Card has been on water quality, but harbour health is also about the wellbeing of plants and animals. Prudent monitoring and management is critical to ensure the health of our harbour. In the future, a more integrated monitoring program will be developed by the many organisations that monitor Darwin Harbour.

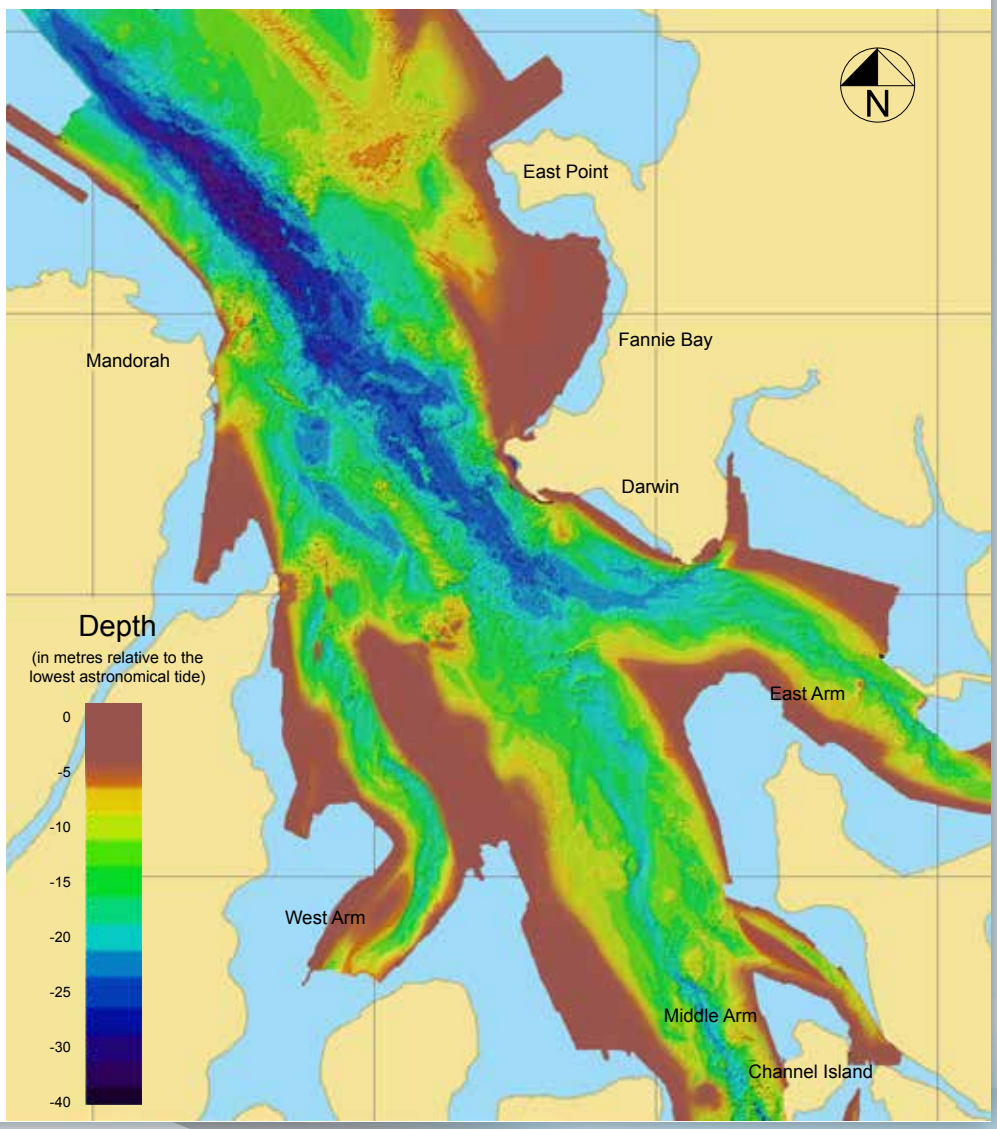
The following stories provide a number of snapshots that help explain the important job of monitoring the health of the harbour. More information is available from web sites listed on the final page of this Report Card.

Mapping seafloor habitats

Mapping the seafloor in the harbour will help us to identify the animals and plants which live in the different regions, and establish the 'baseline data' which will allow us to monitor the environment and to plan for the future. A detailed contour map of the harbour was created in 2011 by using sophisticated sonar equipment mounted on a ship. Surveys to assess the harbour's sediment were conducted, and underwater video cameras were used to capture images of the plants and animals living on the seafloor.

The project will produce reports and digital maps, which will be available to the public in 2014. The accompanying figure shows the range of water depths in different parts of the harbour.

This project is a collaborative effort of the Department of Land Resource Management, Darwin Port Corporation, Australian Institute of Marine Science, GeoScience Australia, and Charles Darwin University. It is a good example of what collaboration can achieve.



Monitoring for Aquatic Pests

Busy shipping and boating areas in the harbour are monitored for the presence of introduced marine pests. Ships, yachts and other vessels come from Asia, the Pacific, and other parts of Australia and may carry unwanted marine pests that would change the harbour's ecosystem if they became established. This program provides an 'early warning' of the arrival of these pests, which greatly increases our ability to contain and eradicate them.

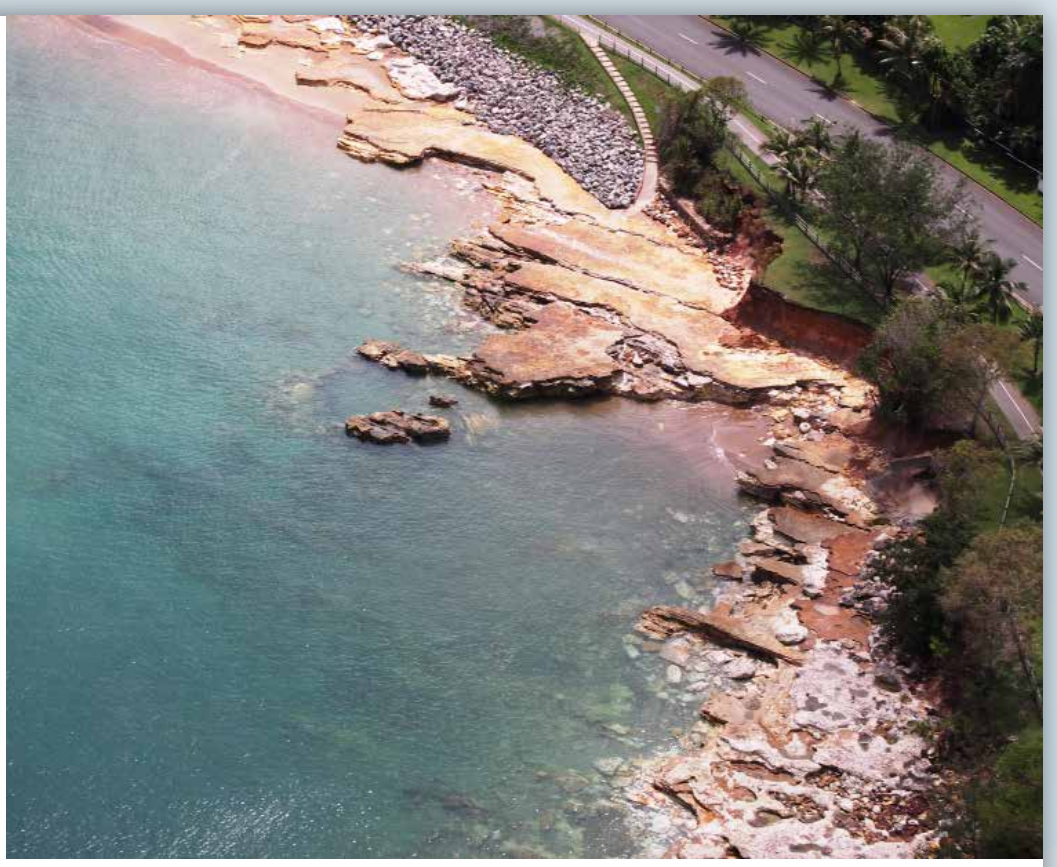
There are monitoring sites in each of Darwin's four enclosed marinas, and at various other locations around the harbour that are most at risk of aquatic pests. Every month biological samples are collected and examined for marine pests. We are pleased to report that no pests were found during 2013. Unlike many other ports in Australia, Darwin Harbour is free of marine pests, and this helps to keep our harbour ecologically healthy. Monitoring is undertaken by the Biosecurity Unit of the Department of Primary Industries and Fisheries.

Dolphin monitoring

Three species of coastal dolphin are found in Darwin Harbour: the Australian Snubfin, the Indo-Pacific Humpback and the Bottlenose. In 2007, the Northern Territory Government established a research program to study these creatures and to monitor changes in dolphin numbers, and changes in the way in which they use the harbour. In 2011, the monitoring program, which is conducted in collaboration with the Department of Land Resource Management, and INPEX Australia, was expanded to include Bynoe Harbour.

The results have shown that dolphin populations are typically small, with 8 snubfin, 40 Indo-Pacific humpback and 18 bottlenose animals in Darwin Harbour. Movement of individuals between Bynoe and Darwin Harbour has been detected for all three species, with four bottlenose dolphins moving between Shoal Bay and Darwin Harbour.

Aerial view of a rocky outcrop off Casuarina Beach, Darwin.



Nightcliff Beach cliffs, Casuarina Drive.

Beach water quality monitoring

Darwin's beaches are open for swimming during the dry season, when the risk of box jelly-fish stings is very low. Nine beaches are monitored throughout the dry season for their water quality to check whether the water is safe from disease causing microbes. Monitoring is done by the Department of Land Resource Management and the Department of Health.

Water samples are tested at the Berrimah laboratory of the Department of Primary Industries and Fisheries. Monitoring throughout the 2013 swimming season showed the beaches were clean, with no beach closures being necessary.

Monitoring by the INPEX operated Ichthys Project

A liquid natural gas plant is being built by INPEX on Middle Arm as part of the 'Ichthys Project' which pipes gas from the Timor Sea. A comprehensive program has been put in place during the construction and dredging phase of the project to monitor the wellbeing of fish, plants, and other animals and to monitor water quality.

For the first time in Darwin Harbour, the underwater noise produced by dredging and ship movement is being monitored to assess whether it is disruptive to dolphins and other marine animals.

The photo shows equipment being lowered onto the seabed to monitor the currents in the harbour, which is a key to our understanding of water quality. With nearly half of the planned dredging completed at June 2013, the results of the Project's 13 monitoring programs indicate that impacts are either consistent with original predictions or less than anticipated.

Sediment monitoring

Monitoring water quality is challenging because water is constantly moving and changing in quality. However sediments – basically the 'mud' on the sea floor - are stationary and can accumulate pollution including heavy metals such as zinc and copper which are washed into the harbour by stormwater runoff. These pollutants can potentially reach toxic levels and endanger the health of marine plants and animals.

A baseline survey undertaken to assess the amount of metals and nutrients in the sediments of the inter-tidal zone mudflats found that these are currently at manageable levels. We will continue to monitor changes to the sediment as this provides us with early warning of the need to act to ensure the ongoing health of the environment.

Rapid Creek Monitoring

Rapid Creek is the largest freshwater stream in the Darwin city area. The creek flows well into the dry season, and provides habitat for several types of fish and freshwater invertebrates such as water bugs, snails and dragonfly larvae. The presence of these invertebrates is a good indicator of the stream's health. The wetlands in the upper part of the creek also provide habitat for at least 10 types of frog.

The invertebrates have been used to measure the ecological health of the stream. Monitoring is undertaken by the Department of Land Resource Management, and Darwin International Airport. Our assessment is that in broad terms the creek is in good condition, especially considering it is located within urban Darwin. The trees and other plants along the creek are looked after by local residents and members of the Rapid Creek Landcare group. This helps to keep the creek healthy and close to natural condition.

Flatback turtle (*Natator depressus*) in the Darwin region.

Korebum Lagoon east of Darwin, one of the many freshwater lagoons in the region. *Nymphaea violacea* pictured, is a common water plant found across the regions lagoon systems.

Monitoring by Indigenous Rangers

The Northern Territory Government has made a commitment to train Indigenous marine rangers to monitor the health of Darwin Harbour. This undertaking will be carried out in partnership with the Larrakia Nation Aboriginal Corporation. Rangers will be trained to undertake tasks including water quality sampling and dolphin monitoring. They will also provide assistance to the migratory bird program which is investigating the way these birds use the Darwin foreshore.

This is an exciting opportunity for young Indigenous men and women to be involved in traditional sea country management, to develop a range of skills which will introduce them to the latest technology, and in doing so maximise their future opportunities in the wider employment market.

Darwin Harbour Water Quality Protection Plan

The Darwin Harbour Water Quality Protection Plan (WQPP) is a list of more than 100 actions from government, industry and community groups that will help ensure that the quality of our harbour is maintained. The actions focus on water quality monitoring, and managing nutrient and sediment pollution to the harbour. The actions include initiatives to reduce soil erosion and improve the management of wastewater and stormwater. Water quality protection is one element of a broader coordinated approach to the management of Darwin Harbour, the rivers that flow into the harbour, and the surrounding land area. The WQPP was funded by the Australian and Northern Territory governments.

Further information:

Previous Report Cards:

http://lrm.nt.gov.au/water/darwin-harbour/reportcards

Darwin Harbour Region Report Card water quality:

Darwin Harbour Water Quality: Supplement to the 2013 Darwin Harbour Region Report Card. Report 12/2013D. Department of Land Resource Management.

http://lrm.nt.gov.au/water/aquatic/publications

Mapping seafloor habitats:

http://lrm.nt.gov.au/plants-and-animals/major-projects-and-partnerships/darwin-harbour-monitoring-project

Aquatic pest monitoring:

http://www.nt.gov.au/d/Fisheries/index.cfm?header=Aquatic%20Biosecurity

Dolphin monitoring:

http://lrm.nt.gov.au/plants-and-animals/major-projects-andpartnerships/darwin-harbour-monitoring-project

Beach monitoring:

http://www.health.nt.gov.au/Environmental_Health/Beach_Water_Quality/#BeachWaterQuality

INPEX monitoring:

http://www.ichthysproject.com/environment

Sediment monitoring:

Darwin Harbour Baseline Sediment Survey 2012. Charles Darwin University and Department of Land Resource Management report.

http://lrm.nt.gov.au/water/aquatic/publications

Rapid Creek Monitoring:

Dry season water quality and macroinvertebrate assemblages in Rapid Creek: an urban stream in the monsoonal tropics of northern Australia. Report 01/2014D. Department of Land Resource Management.

http://lrm.nt.gov.au/water/aquatic/publications

http://www.rapidcreek.org.au/

http://www.darwinairport.com.au/working-airport/environment

Water Quality Protection Plan:

Darwin Harbour Water Quality Protection Plan, Department of Land Resource Management.

A procedure for evaluating the nutrient assimilative capacity of Darwin Harbour. Australian Institute of Marine Science report.

http://lrm.nt.gov.au/water/darwin-harbour/quality

http://lrm.nt.gov.au/water/aquatic/publications