Four Mile Beach

FORESHORE MANAGEMENT PLAN

April 2022

DOUGLAS SHIRE COUNCIL

The Eastern Kuku Yalanji and Yirrganydji Peoples are the Traditional Custodians and Owners of the land and sea country that encompass the Douglas Shire region.

Douglas Shire Council acknowledges the 'Bama', the traditional rainforest Aboriginal coastal people of our region who hold the unique position of being the First Peoples of this country. We recognise and respect Bama cultural heritage, values, beliefs and continuing relationships and responsibility to their land and sea country. We honour and respect your Elders past, present and future.

We commit to maintaining and strengthening our partnerships and respectful relationships with Bama in the spirit of reconciliation so that together we can increase the opportunities for successful and positive outcomes to the advantage of everyone in our communities.

Council respectfully acknowledges other Aboriginal and Torres Strait Islander people who call our region 'home'.

This report has been prepared by Alluvium Consulting Australia Pty Ltd and Wild Environmental for Douglas Shire Council under the contract titled 'WO5429 Foreshore Management Plan'.

Authors: Emily Lazarus (Alluvium)
Mia Gustavsson (Alluvium)
Pam Wong (Alluvium)
Tracy Schultz (Alluvium)
Stephanie Doumtsis (Alluvium)
Delwyn Windridge (Wild Environmental)

Review: Fiona Chandler (Alluvium)
Approved: Emily Lazarus

Version: 05 – Final
Date issued: April 2022
Issued to: Melissa Mitchell
Citation: Alluvium, 2022, Foreshore Management Plan: Four Mile Beach, report prepared by Alluvium Consulting Australia and Wild Environmental for the Douglas Shire Council.

Cover image: Four Mile Beach foreshore.

Contents

Figures

Tables

1 Introduction

The coastline is an important place for many Australians, providing significant social and cultural value. This is especially so for many residents of the Douglas Shire who have identified these unique coastal landscapes and natural ecosystems among some of the most important factors attracting people to this coastline (DSC 2019a). The Douglas Shire coastline also has high tourism value, attracting many visitors to the area.

The Eastern Kuku-Yalanji and Yirriganydji Peoples are the Traditional Custodians of the Land and Sea Country within the Douglas Shire. They have lived in and cared for this region for thousands of years, represented in important cultural sites throughout the Shire, and the memories and experiences of its people; past, present and future.

Douglas Shire Council (DSC) has an extensive 111 km long coastline that extends from Degarra in the north to south of Wangetti. The Shire is well known for its diverse coastline and its proximity to the Great Barrier Reef. Much of the Shire is within the Wet Tropics World Heritage Area and its dynamic coast consists of a variety of sandy beaches, rocky headlands and coastal rainforests.

The region's beaches and foreshore areas are important both to people and to the ecosystems around them. Coastal landscapes provide essential habitat for life on the foreshore and provide visual and recreational amenity to the people. Healthy coastal ecosystems are necessary to promote the resilience of plant and animal communities to coastal hazard impacts. Denser vegetation types are also effective in reducing the destructive forces of a storm tide for communities and infrastructure landward of the foreshore.

However, these ecosystems are experiencing ongoing disturbance as a result of erosion, vehicle and pedestrian access, weeds and pest species, illegal dumping, and runoff from stormwater and agricultural land. These factors threatening dune stability and reducing the erosion buffer often result in vegetation loss, impacts to native fauna species, and changes in ecosystem structure.

To help manage and protect these important coastal zones, DSC has developed five Foreshore Management Plans (FMPs) for the Wonga, Newell, Cooya, Four Mile and Oak Beaches.

1.1 Purpose

In 2019, DSC developed the Resilient Coast Strategic Plan 2019-2029 (referred to henceforth as the Strategy) and have committed to undertake actions to reduce the impacts of coastal hazards, such as erosion and coastal flooding, and activities in the coastal zone. A priority outcome of the Strategy is to undertake dune protection, maintenance and monitoring. This encompasses the foreshore area and is the focus of the FMP.

The FMPs will help to guide Council in the protection, maintenance and management of the coastline and foreshore, while maintaining the natural character of the area and respecting ecological, cultural and social values of these coastal reserves. Funding has been secured through the Queensland Government Reef Assist Program which will be used to support the implementation of the management actions outlined in the FMP.

The plans will:

- Ensure there is a **shared understanding** of the social, cultural, environmental and economic values and uses of the foreshore zone
- Identify options for the **proactive management** of vulnerable areas of the foreshore zone over the next 5 years
- Help **improve and maintain** the vegetation cover and condition in the foreshore zone.

1.2 Foreshore Management Plan area

Four Mile Beach is approximately 5.5 km long and represents approximately 5 % of the Shire's coastal length. The beach forms part of a sandy beach ridge system which extends south from Flagstaff Hill to the mouth of the Mowbray River (DSC 2019b) (Figure 1). There are a number of smaller creek outlets that drain onto the beach and cause minor erosion, however, the beach has relatively healthy and stable dunes. The upper beach is flat and gently slopes down.

Four Mile Beach is located within the Port Douglas suburb area, which is the largest settlement in the Douglas Shire. According to the most recent census, there are approximately 3,500 residents in the Port Douglas area and more than 1,200 dwellings (ABS 2017; DSC 2019b). However, the population can almost double during peak tourist season and is also likely to have increased since 2016. There is a surf lifesaving club located at the northern end of Four Mile Beach, including a guard tower and swimming nets.

1.3 Implementation

This FMP has been developed following a series of site inspections, including vegetation mapping, species identification and coastal morphology assessments, as well as public engagement with residents and ratepayers from Four Mile Beach and the greater Douglas Shire. The site inspections and public engagement have informed the management actions and planning decisions for the Four Mile Beach foreshore area. The management actions have been tailored to incorporate what the community values about their foreshore and how the foreshore is used.

Figure 1. *Four Mile Beach foreshore management area.*

The Four Mile Beach FMP outlines actions for dune protection, including weed species for removal, native vegetation species for regeneration, and pedestrian access management. It also provides a schedule for implementation to allow Council to prioritise actions for the area. This FMP remains non-statutory but once approved by Council provides an informed and proactive guide for the future management of Four Mile Beach.

2 Study area and planning context

Four Mile Beach is a coastal community located on a sandy beach ridge system from Flagstaff Hill to the mouth of the Mowbray River. It is bordered by the Great Barrier Reef Marine Park seaward and the Wet Tropics World Heritage Area to the west. There are a variety of land zoning uses and ecological communities at Four Mile Beach. The following section outlines the DSC land zoning and vegetation and faunal communities that have been identified in literature review and supported by findings from the site visits and surveys.

2.1 Legislative, policy and strategy setting

Coastal management is guided by Commonwealth, State and local legislation. The legislation results in a complex structure of rights and responsibilities. Key legislation, plans, policies and strategies relevant to foreshore management are summarised in Table 1.

Table 1. Summary of the legislation, policy, plans and strategies relevant to foreshore management

Legislation	Relevance

Biosecurity Act 2014	• This Act provides a comprehensive biosecurity framework to manage the impacts of animal and plant diseases and pests.
	• The purpose of this Act is to:
	  ○ Provide a framework for an effective biosecurity system for Queensland.
	  ○ Ensure the safety and quality of animal feed, fertilisers and other agricultural inputs.
	  ○ Help align responses to biosecurity risks in the State with national and international obligations and requirements.
	• The purpose of the Act is also to manage risks associated with emerging, endemic and exotic pests and diseases.

Coastal Protection and Management Act 1995	• This Act aims to provide for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity. • This Act considers the goal, core objectives and guiding principles of the National Strategy for Ecologically Sustainable Development in the use of the coastal zone. • This Act ensures that decisions about land use and development safeguard life and property from the threat of coastal hazards. • This Act encourages the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.

Planning Act 2016	• This Act provides for an efficient, effective, transparent, integrated, coordinated and accountable systems of land use planning and development assessment to facilitate the achievement of ecological sustainability by:
	  ○ Coordinating and integrating planning at the local (i.e., planning schemes), regional and State scales
	  ○ Managing the process and effects of development on the environment (including managing the use of premises).

Native Title Act 1993	• The purpose of this Act is for the recognition and protection of native title.
	• It covers:
	  ○ Acts affecting native title.
	  ○ Determining whether native title exists and compensation for acts affecting native title.

Legislation	Relevance
Aboriginal Cultural Heritage Act 2003	• The main purpose of this Act is to provide effective recognition, protection and conservation of Aboriginal cultural heritage.
Vegetation Management Act 1999	• This Act aims to regulate the clearing of vegetation by: o Managing the environmental effects of clearing. o Regulating clearing in a way that conserves remnant vegetation that is an endangered regional ecosystem, an of concern ecosystem, or a least concern regional ecosystem. o Ensuring clearing does not cause land degradation and allows for sustainable land use. o Preventing the loss of biodiversity, maintain ecological processes, and reduce greenhouse gas emissions.
Environmental Protection Act 1994	• This Act aims to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, and that maintains the ecological processes on which life depends. • The Act defines environmental value, environmental harm and best practice environmental management.
Nature Conservation Act 1992	• This Act aims to conserve nature while allowing for the involvement of indigenous people in the management of protected areas. • This is to be achieved by a conservation strategy for Queensland that declares and manages protected areas, protects native wildlife and habitats, ensures use of protected wildlife and areas to be ecologically sustainable, and allows cooperative involvement of Aboriginal and Torres Strait Islander people.
Environment Protection and Biodiversity Conservation Act 1999	• This Act aims to provide protection of the environment, promote ecologically sustainable development and the conservation of biodiversity. • The Act aims to promote the use of indigenous knowledge of biodiversity through a cooperative approach to the protection and management of environments.
Queensland Local Government Act 2009	• This Act provides a system of local government in Queensland, including: o The way in which a local government is constituted and the nature and extent of its responsibilities and powers o A system of local government in Queensland that is accountable, effective, efficient and sustainable.
Marine Parks Act 2004	• The main purpose of this Act is to provide for conservation of the marine environment. • This purpose as it relates to this plan can be achieved through: o Cooperative involvement of public authorities and other interested groups and persons, including members of Aboriginal and Torres Strait Islander communities. o Recognition of the cultural, economic, environmental and social relationships between marine parks and other areas, whether of water or land.

Legislation	Relevance
Local Laws	• Local laws sit within the *Local Government Act 2009* and under the Act a local government may make and enforce any local law that is necessary or convenient for the good rule and local government of its local government area. • This legislation sets out the laws for the DSC area, including animal management, community and environmental management, local government areas, and facilities.

2.2 Zoning

Land use

The DSC Planning Scheme (2018) has been used to understand the boundaries between different land uses (Figure 2) (DSC 2018a). At Four Mile Beach, the primary land uses within or immediately adjacent to the foreshore area are recreation and open space, and low-medium density and medium density residential. These land uses have implications for the management of the foreshore area. Changes within these zones can have flow-on impacts to the foreshore area, including:

- habitat fragmentation (loss of habitat into smaller, isolated areas)
- runoff
- illegal clearing and planting, including weed dispersal and growth
- impacts on fauna (light and noise pollution, road/beach kills).

Recreation and open space

Much of the length of the Four Mile Beach foreshore area is dedicated to recreation and open space. The purpose of the recreation and open space zone is to provide for informal recreation where the built form is not essential to the enjoyment of the space, parks that serve the recreational needs of residents and visitors, and a range of organised activities that require a level of built infrastructure (DSC 2018a). Relevant outcomes to the recreation and open space zone include (DSC 2018a):

- Areas are provided for active sport and recreation to meet community needs.
- Open space is accessible to the general public for a range of outdoor sport and recreation activities.
- A range of functional and accessible open spaces, including local and regional parks and linkages, are available for the use and enjoyment of residents and visitors.
- Ancillary structures and buildings such as shelters, amenity facilities, picnic tables and playgrounds are provided where necessary.
- Sport and recreation areas are planned and designed to enhance community liveability, scenic amenity and provide a retreat from developed areas.
- The use of sport and recreation areas does not unduly affect the amenity of adjacent areas particularly residential areas.

Residential

Within Four Mile Beach, there are low-medium density and medium density residential areas with and adjacent to the foreshore area. Low-medium density residential areas provide for a range and mix of dwelling types including dwelling houses and multiple dwellings supported by community uses and small-scale services and facilities that cater for local residents. The purpose of the low-medium density residential zone will be achieved through the following relevant outcomes relevant to foreshore management (DSC 2018a):

- Development is designed to provide safe and walkable neighbourhoods.
- Development maintains a high level of residential amenity having regard to traffic, noise, dust, odour, lighting and other specific impacts.
- Development is reflective and responsive to the environmental constraints of the land.

- Development provides a high level of amenity and is reflective of the surrounding character of the area.
- Development is supported by necessary community facilities, open space and recreational areas and appropriate infrastructure to support the needs of the local community.

Medium density residential areas provide the same the same amenity as low-medium density residential zones. The purpose of the zone relevant to foreshore management can be achieved through the following outcomes (DSC 2018a):

- Development is of an appropriate scale and achieves an attractive built form which incorporates the character and natural attributes of the site and the surrounding area as integral features of the theme and design of the development.
- Landscaping enhances the visual appearance of development and the streetscape, provides attractive outdoor spaces and privacy between adjoining development.
- Community facilities, open space and recreational areas and appropriate infrastructure to support the needs of the local community are provided.

Great Barrier Reef Coast Marine Park Zoning

The Great Barrier Reef (GBR) Coast Marine Park Zoning classifies the land and waters below the low tide mark near the Four Mile Beach FMP area as a Conservation Park Zone (Figure 2). This zoning allows for increased protection and conservation of areas while also providing opportunities for reasonable use and enjoyment (GBRMPA 2021). This zoning also permits limited extractive use, including some fishing activities. While this zoning lies outside of the FMP precinct area, activities onshore can have impacts on the GBR Coast Marine Park zones.

Wet Tropics World Heritage Area

The area inland of Four Mile Beach falls under the Wet Tropics World Heritage Area (WTMA n.d.). While this is a consideration for the environmental values of the foreshore area, the World Heritage Area is not directly impacted by the management of the Four Mile Beach foreshore.

Four Mile Beach.

Figure 2. *Four Mile Beach foreshore area land use zoning (DSC 2018, GBRMPA 2021).*

2.3 Coastal hazards

The upper section of Four Mile Beach is vulnerable to coastal erosion (DSC 2019b). This erosion may be temporary or permanent. Temporary erosion is generally caused by storms, winds or waves, and the beach rebuilds during calmer periods. Permanent erosion is more likely to occur over the longer-term due to rising sea levels or significant changes to sediment transport dynamics where sand becomes lost to the coastal system. Erosion may impact the foreshore area, including the vegetation, wildlife habitats, infrastructure, recreational uses or values.

Foreshore management precinct

The foreshore area at Four Mile Beach extends from the highest astronomical tide (HAT) line to the road reserve limit of the recreation and open space zone, with the exception of a small section of low-medium density residential towards the southern end of the beach (Figure 3). This also includes a segment of the foreshore on the seaward side of the Sheraton Grand Mirage Resort. Under the Integrated Resorts Development Act (1988), The Mirage Port Douglas Scheme of Integrated Resort Development is approved and administered by the State. Management of the foreshore and dune area will be in accordance with the Easement agreement.

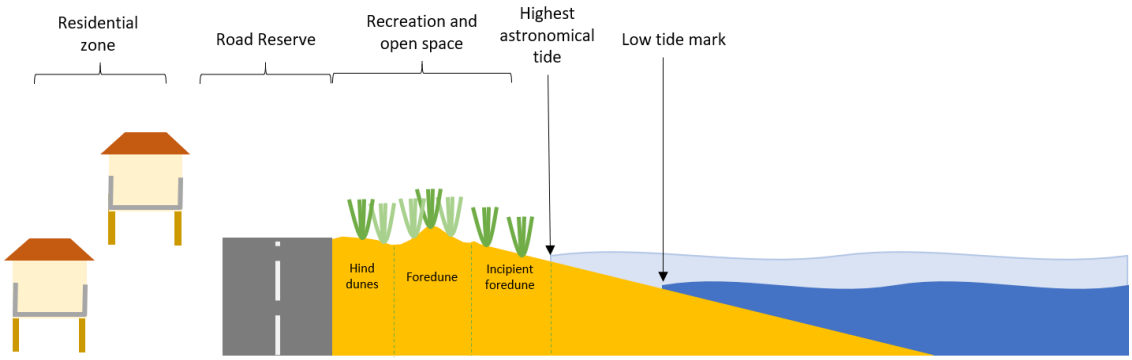


Figure 3. *Graphic representation of the Four Mile Beach foreshore management precinct.*

The foreshore area includes the dune system behind the beach, immediately landward of the HAT mark and is made up of the following three key sections (Figure 3):

- **Incipient foredune:** a windblown platform that forms in front of the foredune, however is not present on all beaches. This is where vegetation such as grasses and creepers first establish and provides a protective buffer to erosion, and storm effects, including winds and waves.
- **Foredune:** the main sandy formation and is of greater height than the incipient dune. Larger vegetation species establish here, including shrubs, which provide greater wind protection.
- **Hind dune:** a smaller dune system behind the foredune. These systems tend to be well established, including larger vegetation species such as trees.

3 Foreshore values

The Four Mile Beach foreshore is valued by residents and visitors for a number of reasons and the management of the foreshore should aim to protect and enhance these values. The following section outlines the social, cultural and environmental values that have been identified for the Four Mile Beach foreshore area, as well as describing any threats or challenges to these values.

Foredune at Four Mile Beach.

3.1 Knowledge sharing and community engagement

The community at Four Mile Beach were engaged through the Resilient Coast Strategic Plan (DSC 2018b). Feedback from this engagement process specific to Four Mile Beach included:

- Residents appreciate the natural beauty of the beach
- There is a preference to retain the coconut palms.

For this FMP, a survey was distributed to the Four Mile Beach community and the wider Douglas Shire residents and ratepayers to understand how they use and what they value about the foreshore zone, and how they would like to see it managed in the future. The survey was advertised through the Council Foreshore Management Plans website, Facebook, community noticeboards, emails to residents and community groups, and physical copies available at Council offices. The survey ran from 31st March to 23rd April 2021 and received a total of 317 responses from residents and community groups throughout the Douglas Shire. A total of 85 responses were received from Four Mile Beach Residents, with most being homeowners.

In addition to the survey, there was a four-week period of public comment following the release of the draft FMP for Four Mile Beach. This public comment period provided residents and ratepayers with an opportunity to submit feedback on the draft FMP. Several drop-in sessions were also held at numerous locations throughout the Shire, including at Port Douglas Community Hall, to allow people to discuss the FMP in greater detail. Feedback from the public consultation has been used to further understand the community values and shape the management actions for the final FMP.

Social values

The majority of respondents at Four Mile Beach live adjacent or within 1 km of the foreshore area. Most respondents also visit the foreshore at least once a week. This information indicates that the foreshore area is significant to residents, ratepayers and visitors at Four Mile Beach.

Residents predominantly use the Four Mile Beach foreshore for exercise and relaxation (Figure 4). The next most common uses for the foreshore area are meeting family and friends or for recreation and picnics. Four Mile Beach is one of two beaches in Douglas Shire where use of the foreshore for recreation activities (e.g., swimming, surfing, kayaking) is more common. The foreshore is used less often for BBQs, fishing and using the

playground. Almost one in five respondents indicated that they are using the foreshore area as an extension of their yard.

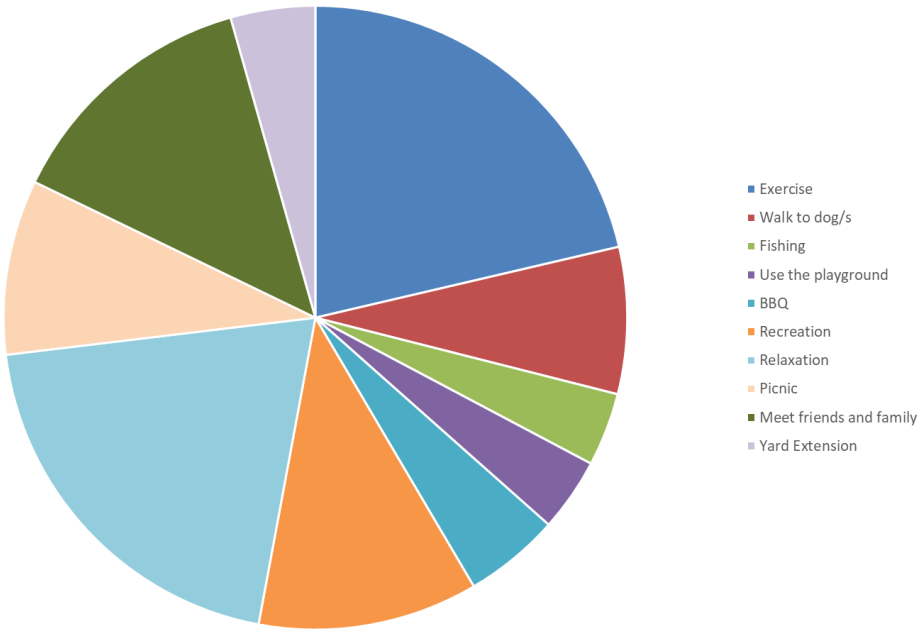


Figure 4. *The most common uses of the foreshore area at Four Mile Beach.*

Sense of place

Residents and visitors of Four Mile Beach value the tropical atmosphere and beauty of the beach, particularly the secluded nature of the beach from the busy town and residential areas. Essential to this seclusion is the well-established natural vegetation buffer that provides protection from storms and cyclones. Four Mile Beach is also appreciated for its abundant plant and birdlife and views of the ocean and surrounding hills.

Four Mile Beach is a place where people can enjoy shaded areas to sit, there are safe paddling areas for children, open parkland spaces, and it is a place to walk and relax. Four Mile Beach is appreciated as a unique tourist area that is safe and accessible.

Concerns and threats

From the survey, several concerns were raised around foreshore vegetation. Some people feel that more maintenance is required to remove weeds and coconut palm fronds, and that clearing of some coconut trees is necessary to allow native vegetation to flourish. There have also been reports of vegetation being cleared to create pathways and ocean views for private properties. This, combined with dumping of garden waste in this zone, fragments natural habitat, encourages weed growth, and impacts upon the secluded feel of the beach that users highly value.

Respondents also commented on issues of misuse and pollution of foreshore areas through illegal camping, fires, and littering of rubbish and dog waste. More signage and prominent rubbish bins may improve this situation. On a similar note, some users wished to remove excess natural debris (e.g., wood, seaweed, palm fronds) that wash up on the beach, however others commented that this “beach grooming” can disturb wildlife and nesting/feeding grounds and remove important habitat and refuge for invertebrates such as crabs.

Along with addressing these issues, some wished for upgrades to and the addition of more foreshore amenities such as BBQs, covered seating areas and picnic facilities. Despite this, survey respondents strongly oppose development close to the foreshore that can be visible from the beach.

Erosion scrap and exposed tree roots on the southern end of Four Mile Beach.

3.2 Environmental values

The vegetation cover along Four Mile Beach has been heavily impacted by illegal clearing to maintain views and access. The remnant vegetation is present only as a narrow strip of semi-intact, impacted foreshore vegetation between 35 and 80 m wide. Towards the southern end of Four Mile Beach however, the vegetation is well connected to the mangrove estuaries of the Mowbray River.

Flora composition

A desktop assessment of the vegetation mapping for the northern section of Four Mile Beach indicates that the largely intact vegetation within this area supports a complex system of communities transitioning from the tidal zone through melaleuca dominated swales, mangroves, and littoral rainforest and contains in a mosaic of six different Regional Ecosystem (RE) types. Ground-truthing of the vegetation mapping has confirmed the local representation of the RE types present. The descriptions, Vegetation Management (VM) Class and Biodiversity (BD) Status of the REs along Four Mile Beach are summarised in Table 2 and Figure 5.

Table 2. Regional Ecosystems of Four Mile Beach

RE	Mapped RE description	VM Class[1]	BD Status[2]	Local representation
7.2.2a	Notophyll vine forests, often with *Acacia* emergents. Species commonly include *Cupaniopsis anacardioides*, *Diospyros geminata*, *Canarium australianum*, *Alphitonia excelsa*, *Acacia crassicarpa*, *Pleiogynium timorense*, *Chionanthus ramiflorus*, *Mimusops elengi*, *Polyalthia nitidissima*, *Millettia pinnata*, *Geijera salicifolia*, *Ficus opposita*, *Sersalisia sericea*, *Terminalia muelleri*, *T. arenicola*, *Drypetes deplanchei*, and *Exocarpos latifolius*. Lowlands on dune sands, of the moist and dry rainfall zones.	OC	E	Heavily impacted/ cleared to occasionally intact areas of dense closed vine forest containing *Syzygium* spp., *Pongamia pinatta*, *Mimusops elengi*, *Cupaniopsis anacardioides*. Clearings were dominated by *Macaranga* sp. and vines and scramblers such as *Flagellaria indica*. Coconuts present in reasonable numbers
7.2.3	*Corymbia tessellaris* (Moreton Bay ash) and/or *Acacia crassicarpa* (beach wattle) and/or *C. intermedia* (pink bloodwood) and/or *C. clarksoniana* (Clarkson's bloodwood) woodland to closed forest. Beach ridges, predominantly of Holocene age.	OC	OC	Not assessed

[1] VM Class: LC – Least Concern, OC – Of Concern, E – Endangered.
[2] BD Status: NC – No Concern, OC – Of Concern, E – Endangered.

RE	Mapped RE description	VM Class[1]	BD Status[2]	Local representation
7.2.4g	*Melaleuca dealbata* +/- *M. leucadendra* woodland to open forest. Weathered relict beach ridges. Palustrine wetland (e.g. vegetated swamp).	OC	OC	Not assessed
7.2.7	*Casuarina equisetifolia* (coast sheoak) +/- *Corymbia tessellaris* (Moreton Bay ash) open forest +/- groved vine forest shrublands. Beach strand and foredune.	OC	E	*Casuarina equesitifolia, Thespesia populnea* and *Terminalia* spp. form the dominant tree layer with occasional *Pandanus cookii.* The coastal facing edge is dominated by shrubs, *Scaevola taccada*, *Wollastonia uniflora* and *Vitex rotundafolia*, vines *Vigna marina* and *Ipomoea pes-caprae*, and grasses and sedges *Ischaemum muticum*, *Thuarea involuta* and *Cyperus pedunculatus.*
7.2.7a	Complex of open shrubland to closed shrubland, grassland, low woodland and open forest. Includes pure stands of *Casuarina equisetifolia*, and Acacia *crassicarpa*, *Syzygium forte* subsp. *forte*, *Calophyllum inophyllum* and Pandanus spp. woodland to open forest. Beach strand and foredune.	OC	E	*Casuarina equesitifolia, Thespesia populnea* and *Terminalia* spp. form the dominant tree layer with occasional *Pandanus cookii.* The coastal facing edge is dominated by shrubs, *Scaevola taccada*, *Wollastonia uniflora* and *Vitex rotundafolia*, vines *Vigna marina* and *Ipomoea pes-caprae*, and grasses and sedges *Ischaemum muticum*, *Thuarea involuta* and *Cyperus pedunculatus.*
7.2.8	*Melaleuca leucadendra* (weeping tea tree) open forest to woodland. Sands of beach origin.	OC	E	Not assessed

Local flora representation at Four Mile Beach - Syzygium sp., Mimusops elengi, Cupaniopsis anacardioides, Casuarina equesitifolia

Figure 5. *Remnant regional ecosystems within Four Mile Beach foreshore area.*

Conservation significance

The remnant vegetation of Four Mile Beach is mapped as 'Essential Habitat' for several conservation significant species including: the endangered southern cassowary (*Casuarius casuarius johnsonii*), eastern curlew (*Numenius madagascariensis*), red knot (*Calidris canatus*), and the lesser sand plover (*Charadrius mongolus*) and the vulnerably listed bar-tailed godwit (*Limosa lapponica baueri*) and greater sand plover (*Charadrius leschenaultii*). Essential habitat is regulated under the *Vegetation Management Act 1999* (VM Act).

Habitat fragmentation

The foreshore vegetation of Four Mile Beach is fairly-well connected in the southern-most section; however, there is little connectivity through the northern areas due to development and the limitations associated with the isolated Island Point end of the beach. The altered vegetation in the urbanised areas often lacks the shrub layer that would allow for protected movement of fauna through the coastal vegetation and beach front areas minimising connectivity through these areas. Canopy dwelling and nesting species may still inhabit these areas and the impacts are more likely to be associated with other anthropogenic activity such as noise and disturbance from tourist related activities. There are a number of disturbances which may impact on the flora and fauna at Four Mile Beach (Table 3).

Table 3. Disturbances and their potential impacts to flora and fauna at Four Mile Beach

Disturbance	Potential impacts to ecology
Dune erosion	• Further loss of vegetation and fauna habitat • Loss of sea turtle nesting habitat through loss of the foredune vegetation • Increase foredune slope and decreasing suitability for nesting sea turtles • Reduced biodiversity
Vegetation loss	• Increases in foreshore dune erosion • Exposure of hind dune systems and vegetation that are less adapted to extreme weather events • Loss of breeding and roosting habitat for nesting shorebirds and sea turtles • Loss of food trees for southern cassowary
Weeds	• Compete with native species for resources – light, nutrients, space • Reduced biodiversity of flora • Loss of habitat and food plants for conservation significant species • Create barriers for connectivity and fauna population dispersal
Pest animals	• Predation of native animals • Sea turtle nest predation • Reduced fauna populations and diversity
Green waste and illegal dumping	• Impacts to marine fauna • Damage to sea turtle nesting areas through suffocation or preventing nesting • Introduction of weed species to natural areas • Increased atypical fire risk
Stormwater and agricultural runoff	• Impacts to marine fauna • Increased sediment runoff and resulting increases in nearshore turbidity • Increased nutrient loads and subsequent algal blooms
Coconut debris	• Fallen fronds and fruit to reduce recruitment of native species • Reduced opportunity for sea turtle nesting • Increase habitat for rodents and potential bird egg predation

Fauna

Four Mile Beach has potential to provide habitat features for a number of fauna of conservation significance, including nesting turtles, shorebirds and other notable species such as the endangered southern cassowary (*Casuarius casuarius johnsonii*) (southern population). While these fauna may not currently be present, there are habitat features to support their survival. Anthropogenic disturbance may be the greatest limiting factor here. The full list of species is provided in Attachment A.

Pest species

Four Mile Beach is not mapped as habitat for conservation significant flora species. Towards the southern end of Four Mile there has been historic coconut palm clearing, which included the removal of 49 mature coconut palms and invasive pest species in 2012 (DSC 2015a). Coconut palms will continue to be managed by the Coconut Management Plan (DSC 2015a). The site of the historic coconut palm clearing is now a revegetation site that undergoes periodic illegal clearing and Council has previously attempted to address this site through the Revegetation Plan for Four Mile Beach Esplanade (DSC 2015b). The following environmental weeds were identified at Four Mile Beach during the site inspections (Table 4). Environment weeds pose a threat to biodiversity by outcompeting native vegetation with respect to available resources such as nutrients and light, establishing monocultures and increasing fuel loads. This additionally results in reduced habitat value for fauna.

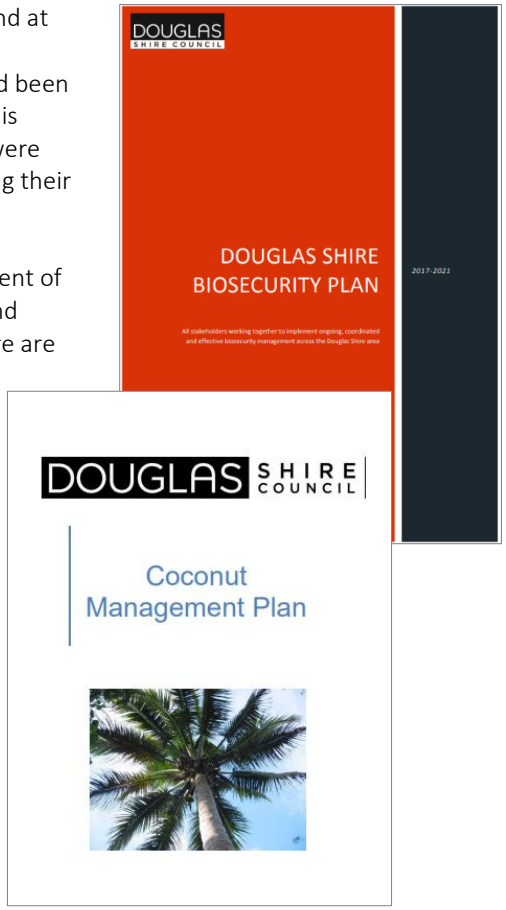
Table 4. Weed species identified at Four Mile Beach (BQ 2020, Conn 2021, DSC 2015b, Murphy et al. 2016)

Scientific name	Common name	Dispersal Method	Environmental Impacts
Cocos nucifera	Coconut palm	• Large nuts which fall from trees • Nuts germinate if uneaten	• Identified as a transformer weed in littoral (coastal) rainforests • Outcompetes native species for space, light and nutrients • Falling nuts and fronds cause physical damage to species below
Sphagneticola trilobata	Singapore daisy	• Spreads by cuttings from slashing and pruning	• Outcompetes native species for space, light and nutrients • Invades lawns, irrigated areas, and around drains
Sansevieria trifasciata	Mother-in-law's tongue	• Spreads by dumping of garden waste • Seeds spread by birds and other animals	• Forms dense infestations • Outcompetes native species for space, light and nutrients • Tends to form monoculture
Bryophyllum delagoense	Mother of millions	• Spread by floodwaters • Spread by animals, vehicles and garden waste	• Invades coastal dunes, grasslands and woodlands • Outcompetes native species for space, light and nutrients • Very poisonous to humans and livestock
Opuntia sp.	Prickly pear	• Spread by birds and animals eating the fruit • Spread by animals and floods moving broken stems	• Outcompetes native species for space and nutrients, esp. in hot, dry conditions • Can harm animals and prevent them from eating
Leucaena leucocephala	Leucaena	• Spreads seeds by wind, water and animals • Spreads rapidly to adjacent areas	• Forms dense thickets which hinder movement of wildlife • Strongly outcompetes native plants for space, light and nutrients

Vegetation management

Douglas Shire Council has a number of instruments to manage the vegetation at Four Mile Beach. The Coconut Management Plan (DSC 2015a) defines the objectives for the management of coconut palms on Council-controlled land. The plan identifies the coconut trees within a given location and provides an assessment of the potential risk, distribution, impacts and associated costs of management.

A revegetation plan has previously been written for two parcels of land at Four Mile Beach, north of Four Mile Park (DSC 2015b). This plan was developed to address the illegal clearing of native vegetation that had been occurring along the esplanade and adjacent coastal lands where DSC is responsible for the management of these areas. These land parcels were assessed during the site inspections and further information regarding their management will be provided in the following sections.



The Douglas Shire Biosecurity Plan (2017-2021) guides the management of invasive biosecurity matter as well as locally declared pests (plants and animals) as outlined in the *Biosecurity Act 2014*. Under this plan, there are programs being undertaken by DSC to eradicate pest species. Prioritisation of pest species is based on several factors, including (DSC 2017):

- Existing plans and priorities on a national, state and local level
- Impacts and threats
    - Conservation and biodiversity
    - Riparian or aquatic environment
    - Agricultural or production
    - Residential and urban areas
- Capacity to manage
    - Achievability
    - Current extent

These programs include (relevant to vegetation) (DSC 2017):

- Siam Weed Eradication Program
- Hiptage eradication Program
- Miconia Species (Four Tropical Weeds Eradication Program)

3.3 Amenity and liveability

There are a number of facilities and access points for residents and tourists to engage in recreational activities at Four Mile Beach. The accessibility and recreational uses of the Four Mile Beach foreshore area are summarised in this section and the management implications are discussed.

Infrastructure

Along the length of Four Mile Beach there are numerous access tracks to provide residents and tourists access to the foreshore and beach. Along the Esplanade from Flagstaff Hill to the Surf Club, there is a paved path for pedestrian use. At this northern end of the beach, there is car parking and a surf lifesaving tower, including a swimming enclosure with netting.

There are openings for drainage onto the foreshore and beach behind the surf club and at Helmet St near Four Mile Beach Park. Runoff from these drains may be causing erosion along the foreshore and contributing to vegetation loss, particularly of larger trees. Additionally, the drain behind the surf club periodically becomes blocked with palm fronds and other debris, impacting the flushing of the drain and creating an odour which affects the amenity of the recreation and open space zone.

Disability access ramp to the swimming enclosure.

There are no boat ramps or boat access points along Four Mile Beach as access is limited to Dickson's Inlet. However, near Four Mile Beach Park, there is an access track for watercraft. This is by foot only and is expected to have minimal impact on the vegetation and erosion.

Passive recreation

Four Mile Beach offers the opportunity for residents and tourists to engage in passive recreational activities. These activities include:

- walking along the foreshore and beach
- bird watching
- watercraft sports
- horse riding

At the southern end of Four Mile Beach near Four Mile Beach Park, there is an area for watercraft sports. This includes an outrigger club and several businesses offering craft hire. There are several formalised access tracks at this location to provide recreational access. Access for boats is limited to Dickson's Inlet, away from Four Mile Beach so it is only smaller craft accessing the beach at this point and no vehicle access is required to launch craft.

These activities are relatively low impact but can still affect the foreshore condition. If foreshore users create informal access tracks through the vegetation to access the foreshore and beach, this can lead to a loss of vegetation, destabilisation of the sand or soil which may lead to erosion or dune destabilisation, and it could also contribute to habitat loss and destruction. Activities such as bird watching and horse riding will have similar impacts on the foreshore in relation to access.

Swimming enclosure at Four Mile Beach.

Pedestrian access

An audit of beach access points in the Douglas Shire found that there are 53 access tracks along Four Mile Beach. There are 21 formal access paths, 20 private accessways to houses and 12 informal access paths. The site inspection indicated that there were several illegally cleared access tracks and landscaping by residents occurring within the Recreation and Open Space buffer zone between the beach and residential area, which falls within the foreshore area of this FMP. The creation of informal access tracks presents challenges to foreshore management, particularly with regards to illegal vegetation clearing and dune destabilisation.

Dog off-leash areas

An off-leash dog area is located at the southern end of Four Mile Beach. Dogs pose a risk to fauna as they may attack or scare vulnerable species, particularly when off-leash.

4 Management precincts

Four Mile Beach has been designated seven management precincts to tailor management actions specific to threats and challenges within each precinct. The seven precincts are (Figure 6):

- Precinct 1 – Four Mile Beach swimming enclosure
- Precinct 2 – Sand St foreshore
- Precinct 3 – Sheraton Mirage foreshore
- Precinct 4 – Solander Blvd foreshore
- Precinct 5 – Reef St foreshore
- Precinct 6 – Four Mile Beach Park
- Precinct 7 – Southern Four Mile Beach

Figure 6. *Four Mile Beach foreshore management precincts.*

The threats and challenges within each management precinct are summarised in Table 5. These threats and challenges have been identified through the background review, site inspections and community engagement feedback.

Table 5. Four Mile Beach foreshore precinct threats and challenges

Precinct	Key foreshore threats and challenges
1 – Four Mile Beach swimming enclosure Significant tourist area with a netted swimming enclosure.	• Illegal clearing to create informal beach access tracks and viewing windows through the vegetation in the foreshore area – these activities may not meet the outcomes of the Conservation zone code, including biological diversity, ecological integrity and scenic amenity. • Line of sight from Surf Lifesaving guard tower obstructed by vegetation. • Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods). • Coconut palm debris blocking drainage of an outlet that extends behind Surf Club.
2 – Sand St foreshore Residential area set back from foreshore.	• Environmental weeds present – may impact the conservation value within the precinct. • Illegal clearing to create informal beach access tracks through the vegetation in the foreshore area – these activities may not meet the outcomes of the Conservation zone code, including biological diversity, ecological integrity and scenic amenity. • Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods).
3 – Sheraton Mirage foreshore Tourist accommodation directly on the foreshore.	• Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods). • Management of the precinct overseen by the Sheraton Grand Mirage in accordance with the existing Easement agreement.
4 – Solander Blvd foreshore Residential area set back from the foreshore.	• Significant illegal clearing to create beach access tracks and viewing windows through the vegetation in the foreshore zone – multiple well-established access tracks through vegetation from the houses to the beach, including encroachment on Council land designated to Recreation and Open Space. • Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods).
5 – Reef Street foreshore Residential area set back from the foreshore.	• Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods).
6 – Four Mile Beach Park Mixed residential and recreation area.	• Significant illegal clearing to create access tracks through the vegetation in the foreshore zone, including encroachment onto the land between Low-medium density Residential and the beach. • Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods).
7 – Southern Four Mile Beach Residential and aged care facilities set back from the foreshore.	• Natural debris washed up on foreshore (e.g., seaweed, mangrove seed pods).

5 Management plan

The following section outlines the adaptive management approach to address the threats and challenges that have been identified for the Four Mile Beach foreshore area. The objectives for management have been identified in order to inform measures for management success. Priorities have also been set to appropriately guide management of the foreshore threats and challenges over the immediate, medium and longer-term timeframes. The objectives and priorities shape the management actions for each precinct. In addition, any monitoring and evaluation activities that are to take place following the implementation of the actions will also be summarised to measure the progress of the foreshore management.

5.1 Management objectives

Objectives are useful for measuring the success of the management actions undertaken. They are based on the community values identified through the engagement process. The objectives will guide the metrics for monitoring and evaluation of the management actions. They can be applied at the whole of foreshore (community) and precinct scale.

Management objectives for Four Mile Beach foreshore

- Maintain the overall natural form and function of the beach.
- Enhance and maintain vegetation condition – littoral rainforests, dune vegetation for vulnerable species and to prevent dune erosion.
- Build positive behaviour change outcomes to minimise adverse impacts of foreshore use.
- Proactively undertake weed management to restore native vegetation habitats.
- Enforce illegal clearing local laws to prevent further establishment of unauthorised and informal beach access tracks.

5.2 Management prioritisation

Prioritisation of the management actions has been assigned as:

1 **Immediate** (recommend implementation within next 12 months)

Actions for immediate prioritisation include sites where weeds are present and it is necessary to eradicate the weeds and revegetate the site with native vegetation cover. Environmental weeds pose a significant threat to the values of the Four Mile Beach residents, including the natural habitats and wildlife. Actions also revolve around access and use of the foreshore area, such as for ATVs, fishing or pedestrians. The uses may pose a threat the sensitive habitats and management actions are focussed on minimising the impact.

2 **Medium-term** (recommend implementation within next 2-3 years)

Medium term priority actions are recommended to be implemented within the next two to three years. These actions are important for the management of the foreshore precinct, however, they require community engagement and education to understand their benefits. There is an element of community involvement with the medium-term actions.

3 **Future** (recommend implementation within 5 years)

Future management actions are those that first require an evaluation of the outcomes from immediate to medium-term actions that have been undertaken before being implemented. It is recommended that future actions are implemented within five years. This timeframe allows sufficient time for immediate actions to be implemented and their progress and success to be evaluated.

Four Mile Beach.

5.3 Management actions

Management actions and their priorities for the Four Mile Beach foreshore are summarised in Table 6. Maps of the management actions for each precinct are provided in Attachment B. Public consultation will occur before any management actions are implemented.

Table 6. Four Mile Beach foreshore precinct management actions

	All precincts	*Precinct 1*	*Precinct 2*	*Precinct 3*	*Precinct 4*	*Precinct 5*	*Precinct 6*	*Precinct 7*
Outcome 1: **Protect and maintain the natural form and function of the beach.**								
A1.1: Formalise and maintain defined access tracks and install appropriate signage at the beach and land entrances. This is to minimise the impact on the frontal dune. Issue fines for people found to be illegally clearing under Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads).	1							
A1.2: Commence a dune protection and maintenance program in consultation with adjacent landholders using the northern end of Four Mile Beach as a pilot site. Undertake dune revegetation with native species (see Attachment C) within a 5 m buffer landward of the HAT mark with low-growing species to maintain views and to stabilise the dune to protect against erosion. Only authorised Council staff to prune vegetation to maintain views. Install fencing around the revegetated area to reduce damage or clearing and encourage regrowth.		1						
Outcome 2: **Restore the biological diversity, ecological integrity, cultural value, scenic amenity and dune stability of the foreshore area.**								
A2.1: Undertake dune revegetation using native species (see Attachment C) within a 10 m buffer landward of the HAT mark with low-growing species to maintain views, and regenerate land that has been cleared and to stabilise the dune to protect against erosion. Install fencing around the revegetated area to reduce damage or clearing and encourage regrowth.			2		1		2	3

	All precincts	*Precinct 1*	*Precinct 2*	*Precinct 3*	*Precinct 4*	*Precinct 5*	*Precinct 6*	*Precinct 7*
A2.2: Undertake beach monitoring of turtle and shorebird nesting sites during nesting and hatching seasons to understand the impact foreshore access may have on these habitats. Survey vegetation cover to assess revegetation requirements and progress to support nesting habitats.	3							
A2.3: Establish a platform on the DSC Environmental Hub giving residents and visitors the ability to upload information and photos about flora and fauna species they have noticed in the foreshore.	1							
A2.4: Establish several zones of management along the foreshore at Solander Blvd: 1) Establish a 10 m buffer zone landward of HAT mark to stabilise the dune and prevent erosion by revegetating with native species. 2) Zone reserved for recreation and open space that is maintained by DSC and establishes a native vegetation buffer between the dune and the residential area. 3) Shared zone between DSC and landowners that provides a pathway to formalised beach access tracks and shared maintenance opportunity by landscaping with native plants and ensuring a suitable buffer to minimise the risk of damage to private infrastructure from trees. Develop a Memorandum of Understanding (MoU) and undertake community consultation to discuss how the shared management responsibilities will work. Ensure that the area is cleared and maintained free of invasive species and green waste dumping. The MoU will also outline clear guidelines on the infrastructure that will be accepted within the shared zone (3).					1			

	All precincts	*Precinct 1*	*Precinct 2*	*Precinct 3*	*Precinct 4*	*Precinct 5*	*Precinct 6*	*Precinct 7*
A2.5: Maintain marine debris along the foreshore within the netted swimming enclosure in accordance with the DSC Marine Plant Management Strategy. Remove coconut debris to prevent accumulation. Coconut removal to be in accordance with the Coconut Management Plan and following community consultation and discussion with adjacent landowners.		1						
A2.6: Council to ensure existing vegetation is kept trimmed to maintain a line of sight of the netted swimming area from the lifeguard tower.		1						
A2.7: Collaborate with Traditional Owners to maintain and preserve cultural heritage sites within the foreshore area.	1							
A2.8: Maintain the foreshore area between Helmet and Cowrie Street to a high-profile standard. Council acknowledges the Coconut Grove site has historical significance for the Shire, including our World War 2 diggers and as a wedding location. Only Council or Council approved Contractors are to undertake works within this area and all works must be authorised by Council.							1	
Outcome 3: **Restore the conservation value of the foreshore area by reducing the presence and impact of environmental weeds.**								
A3.1: Establish a weed eradication and maintenance program in conjunction with the Biosecurity Plan to remove environmental weeds present in the foreshore area and undertake revegetation with native species (See Attachment C).			1		2		2	
Outcome 4: Build positive behaviour change to minimise adverse impacts on the foreshore.								
A4.1: Provide community education material regarding the limitations placed on Council to remove debris along the foreshore and beach which sits within the Great Barrier Reef Marine Park Zone.	2							

	All precincts	*Precinct 1*	*Precinct 2*	*Precinct 3*	*Precinct 4*	*Precinct 5*	*Precinct 6*	*Precinct 7*
A4.2: Undertake a community education program to communicate knowledge around foreshore clearing and weeds, including transfer and establishment, awareness and management, and the benefits of dune vegetation. Extend this education to include contractors engaged by private landholders.	1							
A4.3: Include crocodile awareness information when undertaking new programs (e.g., booklets for walks).	1							

Four Mile Beach.

5.4 Monitoring and evaluation

The success of the management actions is measured through monitoring and evaluation mechanisms. The monitoring focusses on the sensitive and vulnerable environments, including turtle and shorebird nesting habitats, and key coastal vegetation habitats.

Nesting habitats

The habitat monitoring should be undertaken to observe where turtle and shorebird nesting habitats are present in the foreshore area and to understand the vegetation composition of these habitats. Turtle monitoring should be undertaken based on the Queensland Marine Turtle Field Guide (Attachment F) between October and May to understand the seasonal use of these habitats by turtles (QPWS, DES 2016). Guidelines for shorebird monitoring will need to be developed based on local knowledge.

It is recommended that the monitoring be undertaken in partnership with the Indigenous Rangers and local community groups. In addition, a platform on the DSC Environmental Hub website should be created for residents and visitors to submit photos and information regarding any turtle or shorebirds they notice when using the foreshore. The purpose of the habitat monitoring is to understand which species are accessing the foreshore area for nesting and hatching, as well as the vegetation composition of these habitats.

Vegetation

The vegetation monitoring is a simple measure for the percentage of cover and survival success. This monitoring should be undertaken on a yearly basis to record the survival rate. It is recommended that vegetation is monitored on a yearly basis at the end of the wet season.

The purpose of collecting information about the success of revegetation and other site management issues such as exotic plants (environmental weeds), other threats, habitat quality and connectivity, and significant species values is to be able to refine and direct resources accordingly. Flexibility in program delivery is required to maintain the condition of assets such as plantings, respond to threats as they change through time and account for new values if they emerge during the delivery of the project.

Monitoring and evaluation metrics

Table 7 outlines the monitoring and evaluation metrics for the corresponding management action to evaluate the progress and success of implementation. A detailed method for rapid vegetation assessment is supplied in Attachment D.

Table 7. Foreshore management action monitoring and evaluation metrics

Management action	Monitoring	Evaluation	Timing
Vegetation monitoring	• Species specific observations to identify which species may be doing poorly • Weed cover within each of the canopy layers (top 5 transforming weed species)	• Measure of the percentage survival of revegetation • Percentage survival of key species • Percentage cover over canopy layers of weeds • Percentage of bare/disturbed ground • Natural recruitment • Habitat connectivity • Significant species	Annual
Fauna monitoring	• Nesting species • Vegetation composition of nesting habitats	• Turtle tracks, bird nests • Population dynamics • Animal health	Nesting season

6 References

Australian Bureau of Statistics (ABS) (2017). 2016 Census QuickStats. Accessed online from: https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20QuickStats

Business Queensland (BQ) (Queensland Government) (2020). Invasive plants. Accessed 13th April 2021 from: https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants

Conn, B.J. (2021) Loganiaceae. In: *Weeds Australia*. Centre for Invasive Species Solutions, Canberra. Accessed 13th April 2021 from: https://profiles.ala.org.au/opus/weeds-australia

Department of Agriculture and Fisheries (DAF) (2017). Accepted development requirements of operational work that is the removal, destruction or damage of marine plants.

Department of Resources (DOR) (2020). Vegetation management regional ecosystem map – version 11.0.

Douglas Shire Council (DSC) (2015a). Coconut Management Plan.

DSC (2015b). Revegetation Plan: Four Mile Beach Esplanade.

DSC (2017). Douglas Shire Biosecurity Plan 2017-2021.

DSC (2018a). Douglas Shire Council Planning Scheme.

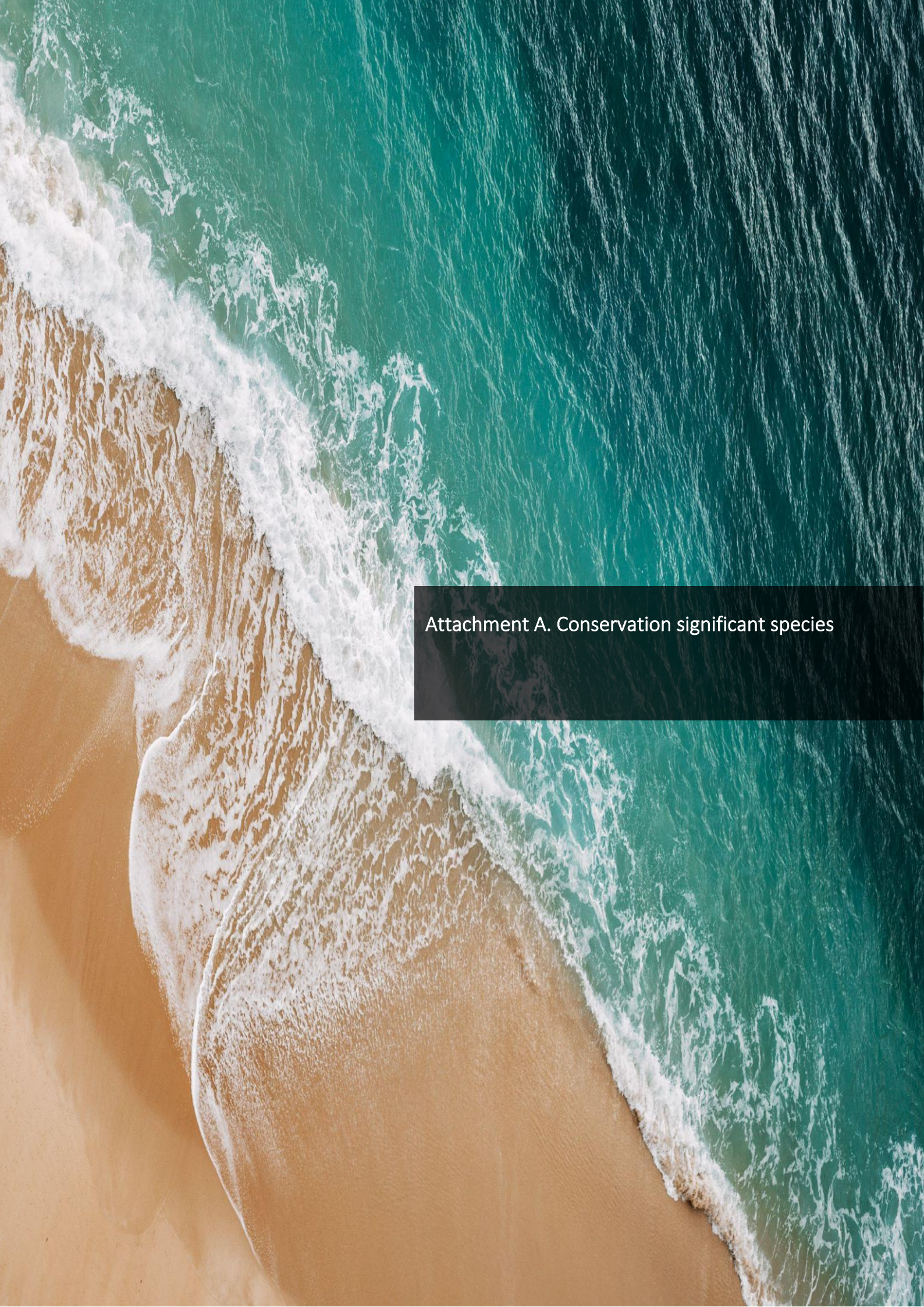
DSC (2018b). Coastal Hazard Adaptation Strategy Phase 3-5 Douglas Shire Council: Community Survey Results.

DSC (2019a). Building a Resilient Coast for Douglas Shire: Community Engagement Results.

DSC (2019b). Resilient Coast Strategic Plan.

Florentine, S., Pohlman, C. and Westbrooke, M. (2015). The effectiveness of different planting frameworks for recruitment of tropical rainforest species on ex-rainforest land. Doi: https://doi-org.elibrary.jcu.edu.au/10.1111/rec.12317.

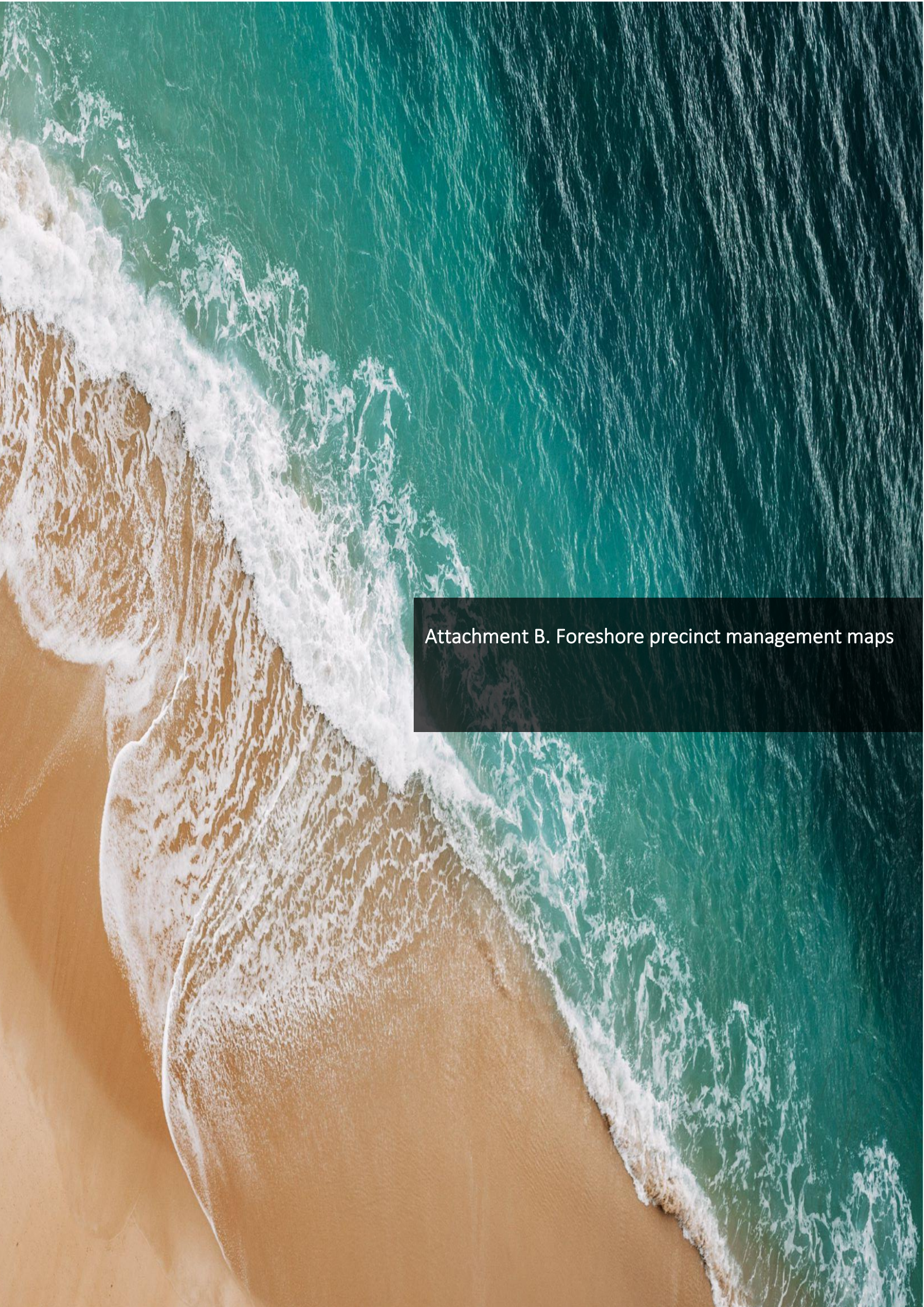
Murphy H T, Ford A, Graham E, Metcalfe D (2016) Mapping to underpin management of tropical littoral rainforest. CSIRO, Cairns.



Attachment A. Conservation significant species

Table 8. Conservation significant fauna and their likelihood of occurrence at Four Mile Beach

Scientific name	Common name	EPBC Act	NC Act	Likelihood of occurrence
		Shorebirds		
Esacus magnirostris	Beach-stone curlew	—	V	Likely
Casuarius casuarius johnsonii	Southern cassowary	E	E	Possible
Calidris ferruginea	Curlew sandpiper	CE	CE	Likely
Numenius madagascariensis	Eastern curlew	CE	E	Likely
Charadrius mongolus	Lesser sand plover	E	E	Likely
Charadrius leschenaultii	Greater sand plover	V	V	Likely
Calidris canutus	Red knot	E	E	Likely
		Sea turtles		
Natator depressus	Flatback turtle	V	V	Likely
Chelonia mydas	Green turtle	V	V	Likely
Eretmochelys imbricata	Hawksbill turtle	V	E	Likely
Dermochelys coriacea	Leatherback turtle	E	E	Possible
Caretta caretta	Loggerhead turtle	E	E	Likely
Lepidochelys olivacea	Olive ridley turtle	E	E	Likely
		Other		
Hirundapus caudacutus	White-throated needletail	V	V	Likely
Cyclopsitta diophthalma macleayana	Macleay's fig-parrot	—	V	Likely
Crocodylus porosus	Estuarine crocodile	—	V	Likely



Attachment B. Foreshore precinct management maps

Figure 7. *Four Mile Beach foreshore precinct 1 management actions.*

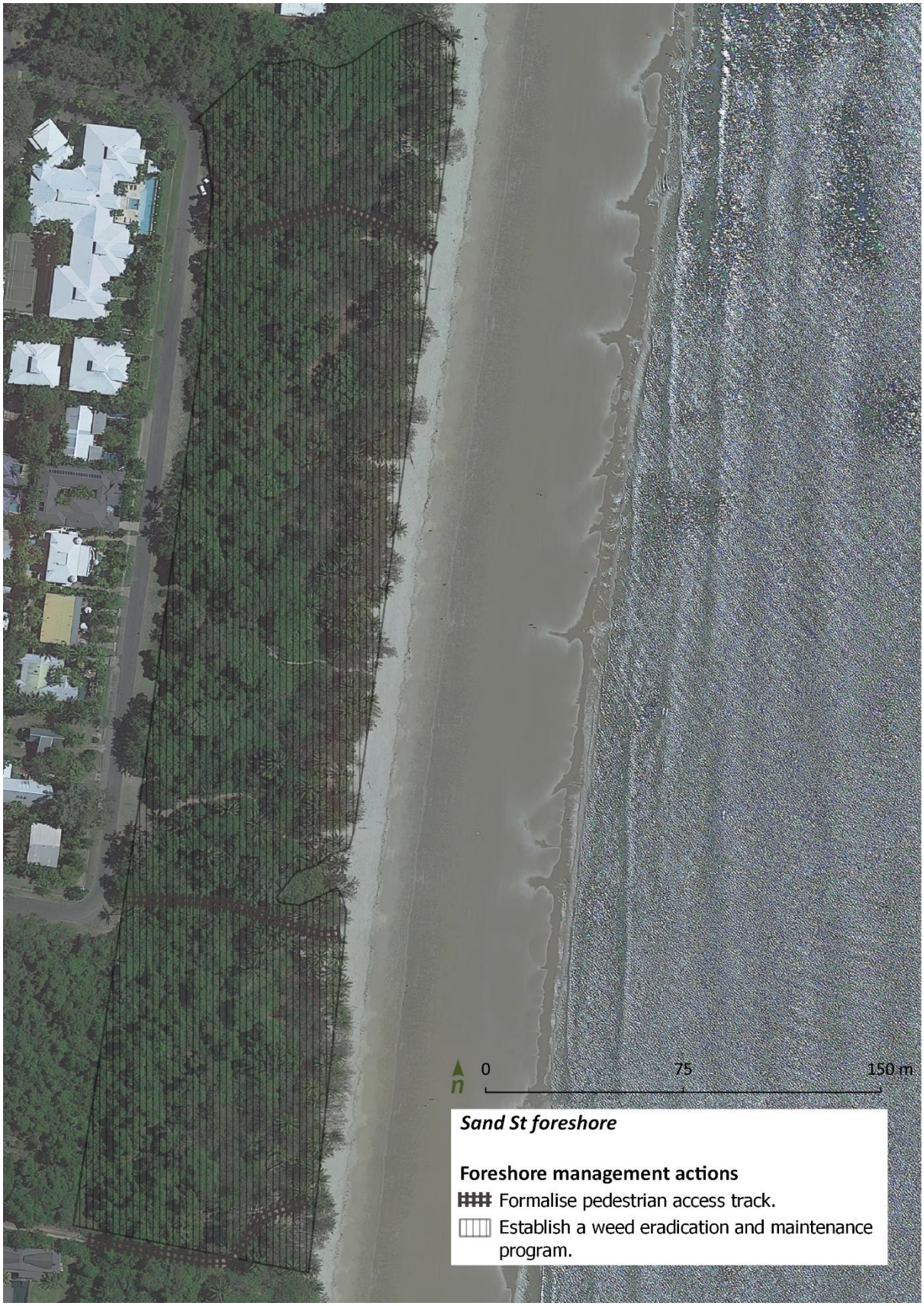


Figure 8. *Four Mile Beach foreshore precinct 2 management actions.*

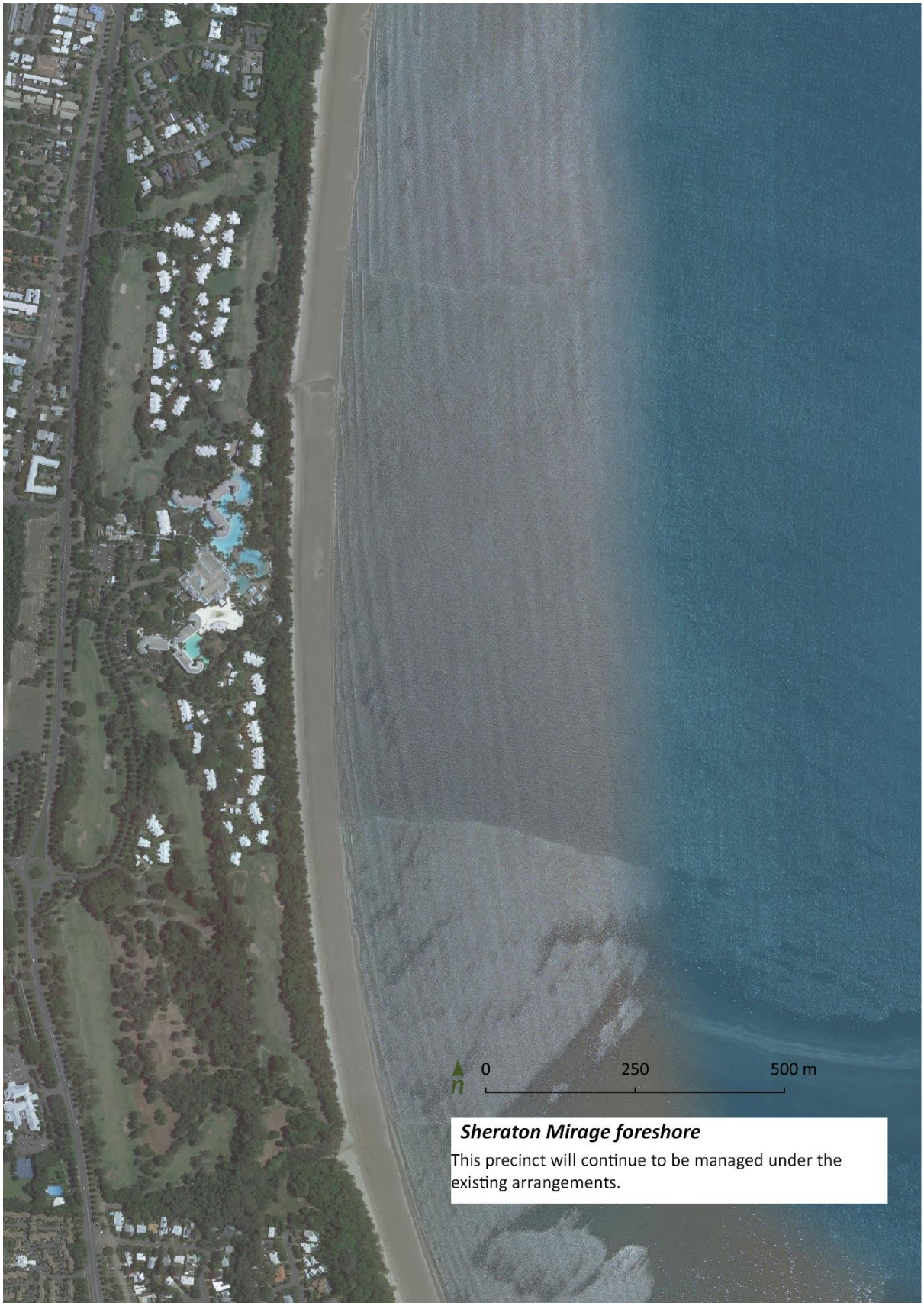


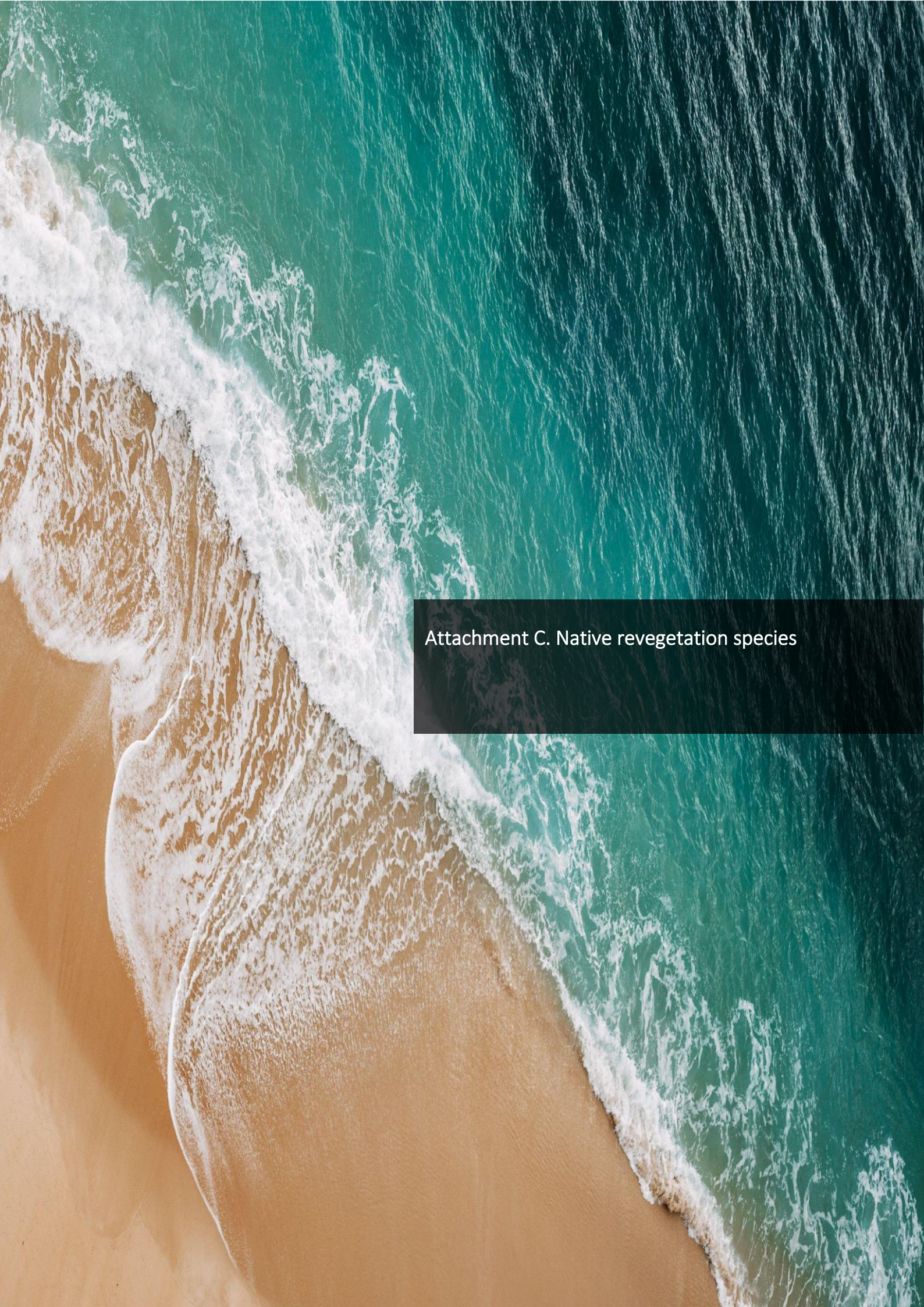
Figure 9. *Four Mile Beach foreshore precinct 3 management actions.*

Figure 10. *Four Mile Beach foreshore precinct 4 management actions.*

Figure 11. *Four Mile Beach foreshore precinct 5 management actions.*

Figure 12. *Four Mile Beach foreshore precinct 6 management actions.*

Figure 13. *Four Mile Beach foreshore precinct 7 management actions.*



Attachment C. Native revegetation species

Table 9. Native revegetation species for foreshore precincts where revegetation has been recommended (highlighted species are key components of remnant ecosystems) (Florentine, Pohlman and Westbrooke 2015)

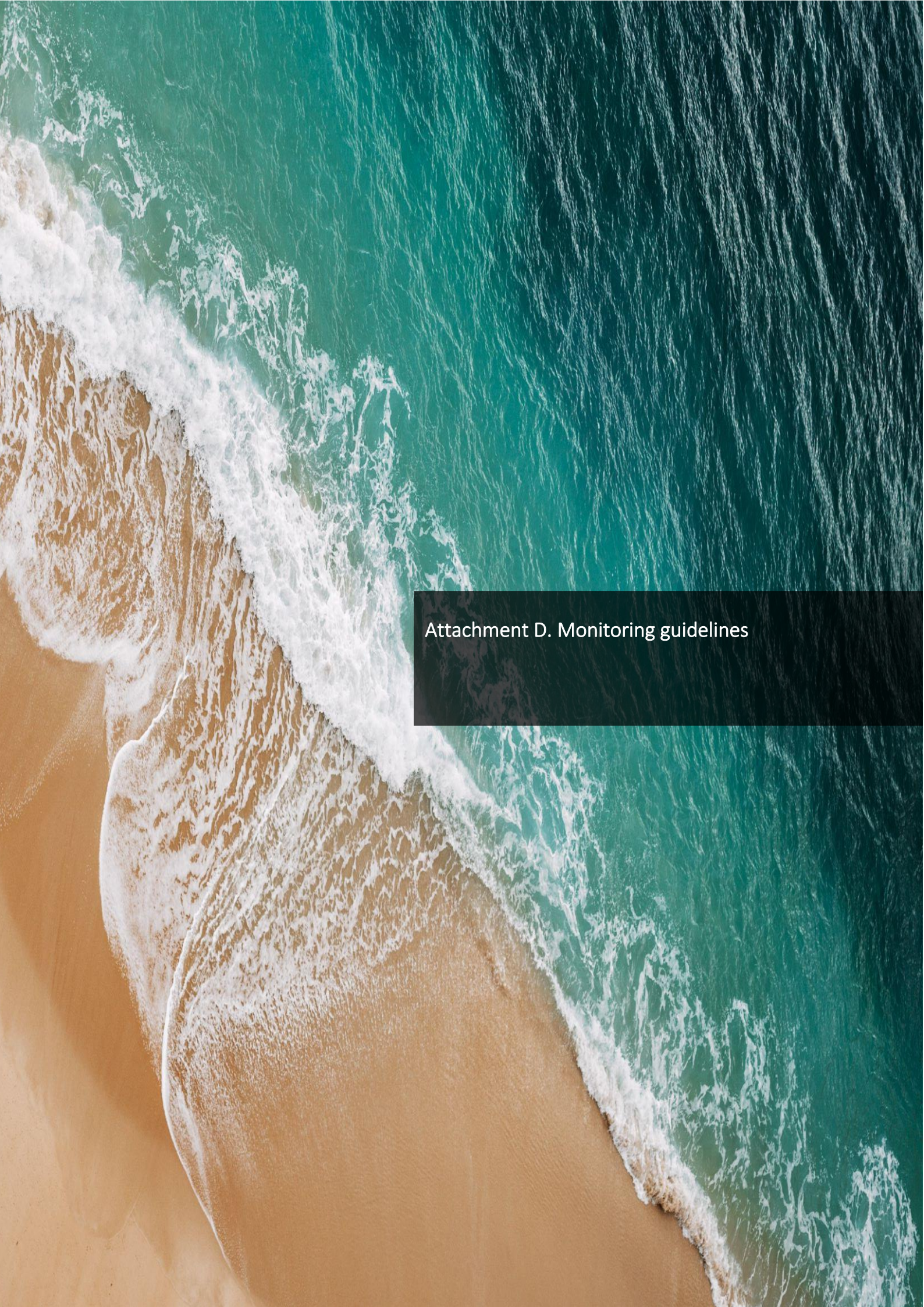
Botanical name[3]	Common name	Precinct 1	Precinct 2	Precinct 4	Precinct 6	Precinct 7
*Acacia crassicarpa**	Northern golden wattle		✔	✔		✔
*Acacia mangiu**	Broadleaf salwood		✔	✔		✔
*Acacia oraria**	Coastal wattle		✔	✔		✔
Aglaia elaeagnoidea	Coastal boodyarra		✔	✔		✔
*Alphitonia petriei**	Sarsaparilla		✔	✔		✔
Alyxia spicata	Chain fruit		✔	✔		✔
Atractocarpus fitzalanii	Brown gardenia		✔	✔		✔
Barringtonia asiatica	Mango bark, Mango pine		✔	✔		✔
Barringtonia calyptrata	Mango pine		✔	✔		✔
Beilschmiedia obtusifolia	Blush walnut		✔	✔		✔
Blepharocarya involucrigera	Rose butternut		✔	✔		✔
Brachychiton acerifolius	Illawarra flame tree		✔	✔		✔
Breynia cernua	Fart bush		✔	✔		✔
Calophyllum inophyllum	Beach calophyllum		✔	✔		✔
Calophyllum sil	Blush touriga		✔	✔		✔
Canarium vitiense	Canarium		✔	✔		✔
Carallia brachiata	Corky bark, Fresh water mangrove		✔	✔		✔
*Casuarina equisetifolia**	Beach casuarina		✔	✔		✔
Cerbera manghas	Dog bane		✔	✔		✔
Chionanthus ramiflora	Native olive		✔	✔		✔
*Clerodendrum floribundum**	Lolly bush		✔	✔		✔
Clerodendrum inerme	Scrambling clerodendrum		✔	✔		✔

[3] * denotes pioneer species that will grow and establish quickly, allowing for natural recruitment or planting of secondary species.

Botanical name[3]	Common name	Precinct 1	Precinct 2	Precinct 4	Precinct 6	Precinct 7
*Clerodendrum longiflorum**	Long flowered clerodendrum		✔	✔		✔
*Colubrina asiatica**	Beach berry bush		✔	✔		✔
*Cordia subcordata**	Sea trumpet		✔	✔		✔
Crinum pedunculatum	Beach lily, Swamp lily		✔	✔		✔
Cupaniopsis anacardioides	Beach Tamarind		✔	✔		✔
Cyperus pedunculatus		✔	✔	✔	✔	✔
Deplanchea tetraphylla	Golden bouquet tree		✔	✔		✔
Dillenia alata	Red beech		✔	✔		✔
Diospyros compacta	Australian ebony		✔	✔		✔
*Dodonea viscosa**	Hop bush		✔	✔		✔
Elaeodendron melanocarpum	False olive		✔	✔		✔
Eucalyptus plattyphylla	Ghost gum		✔	✔		✔
*Euroschinus falcata**	Pink poplar		✔	✔		✔
Ficus benjamina	Weeping fig		✔	✔		✔
Ficus drupacea	Drupe fig		✔	✔		✔
Ficus microcarpa	Small fruited fig		✔	✔		✔
Ficus opposita	Sandpaper fig		✔	✔		✔
Ficus racemosa	Cluster fig		✔	✔		✔
*Ganophyllum falcatum**	Daintree hickory		✔	✔		✔
Glochidion harveyanum	Harvey's buttonwood		✔	✔		✔
Glochidion philippicum	Daintree cheese tree		✔	✔		✔
Gmelina dalrympleana	White beech		✔	✔		✔
Gomphandra australiana	Buff beech		✔	✔		✔
*Guioa acutifolia**	Glossy tamarind		✔	✔		✔
Haemodorum coccineum	Blood root	✔	✔	✔	✔	✔

Botanical name[3]	Common name	Precinct 1	Precinct 2	Precinct 4	Precinct 6	Precinct 7
*Hibiscus tiliaceus**	Coast cottonwood		✔	✔		✔
Intsia bijuga	Kwila		✔	✔		✔
*Ipomoea pes-caprae**	Coastal morning glory	✔	✔	✔	✔	✔
Jagera pseudorhus	Foambark		✔	✔		✔
Livistona muelleri	Northern Cabbage Tree Palm		✔	✔		✔
Lophostemon suaveolens	Swamp mahogany, swamp box		✔	✔		✔
*Macaranga tanarius**	Kamala, Blush macaranga		✔	✔		✔
Mallotus philippensis	Red Kamala		✔	✔		✔
Maytenus fasciculiflora	Orangebark		✔	✔		✔
Melaleuca leucadendra	Weeping paperbark		✔	✔		✔
Melaeuca viridiflora	Broad leaved paperbark		✔	✔		✔
Melia azederach	White cedar		✔	✔		✔
Micromelum minutum	Lime berry		✔	✔		✔
Miliusa brahei	Rasberry jelly plant		✔	✔		✔
*Millettia pinnata**	Pongamia tree		✔	✔		✔
Mimusops elengi	Red coondoo		✔	✔		✔
Mischocarpus exangulatus	Red bell mischocarp		✔	✔		✔
Morinda citrifolia	Rotten cheesefruit		✔	✔		✔
Pandanus tectorius	Beach pandan		✔	✔		✔
*Pittosporum ferrugineum**	Rusty pittosporum		✔	✔		✔
Planchonia careya	Cocky apple		✔	✔		✔
Pleiogynium timorense	Burdekin plum		✔	✔		✔
*Polyscias elegans**	Celerywood		✔	✔		✔
Pouteria chartacea	Thin leaved coondoo		✔	✔		✔

Botanical name[3]	Common name	Precinct 1	Precinct 2	Precinct 4	Precinct 6	Precinct 7
Pouteria obovata	Yellow boxwood		✔	✔		✔
*Premna serratifolia**	Coastal premna		✔	✔		✔
Ptychosperma elegans	Solitaire palm		✔	✔		✔
Rhus taitensis	Sumac		✔	✔		✔
*Scaevola taccada**	Beach lettuce	✔	✔	✔	✔	✔
Schefflera actinophylla	Umbrella tree		✔	✔		✔
Scolopia braunii	Brown birch		✔	✔		✔
Sporobolus virginicus	Sand couch	✔	✔	✔	✔	✔
Sterculia quadrifida	Peanut tree		✔	✔		✔
Syzygium angophoroides	Yarrabah satinash		✔	✔		✔
Syzygium hemilamprum (Syn. Acmena hemilampra)	Blush satinash		✔	✔		✔
Tarenna dallachiana	Tree ixora		✔	✔		✔
Terminalia arenicola	Brown damson		✔	✔		✔
*Terminalia catappa**	Indian almond		✔	✔		✔
Terminalia microcarpa	Damson plum		✔	✔		✔
Terminalia muelleri	Mueller's damson		✔	✔		✔
*Thespesia populneoides**	Tulip tree		✔	✔		✔
Thuraea involuta	Tropical beachgrass	✔	✔	✔	✔	✔
Timonius timon	False fig		✔	✔		✔
Vitex rotundifolia	Beach vitex	✔	✔	✔	✔	✔
Vigna marina	Beach pea	✔	✔	✔	✔	✔



Attachment D. Monitoring guidelines

Rapid Vegetation Assessment Method Data collection

General survey information	Survey ID	Description of survey					
	Assessor Name/s	Descriptive text					
	Date of record	Date					
	Assessment number	Assessment	1	2	3	4	5
Specific location	General Location	Descriptive text					
	Easting	GPS spatial data					
	Northing	GPS spatial data					
	Spatial uncertainty	GPS spatial data					
Desired cover by year 5							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
Current overall cover							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
Percentage survival of each layer							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
Species specific observations							
	% Understorey		% Mid-storey		% Overstorey		%
Sp. 1							
Sp. 2							
Sp. 3							
Sp. 4							

Sp. 5							
Environmental weeds cover							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
High threat environmental weeds							
	% Understorey		% Mid-storey		% Overstorey		%
Sp. 1							
Sp. 2							
Sp. 3							
Sp. 4							
Sp. 5							
Bare ground created by disturbance							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Vehicles							
People							
Erosion							
Other							
Natural recruitment							
	Absent		Present		%		
Under							
Mid							
Over							
Connectivity							
	Patch size (ha)		Distance (km)		Connection		
Patch 1					H	M	L
Patch 2					H	M	L
Patch 3					H	M	L
Significant species identified							
	Location	Population size	Threat		Proposed response		

Sp. 1				
Sp. 2				
Sp. 3				

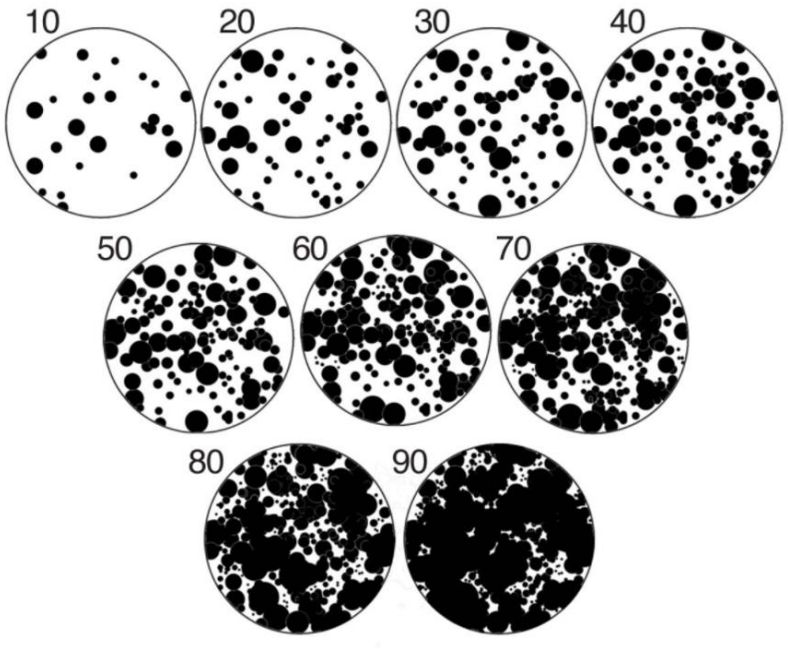
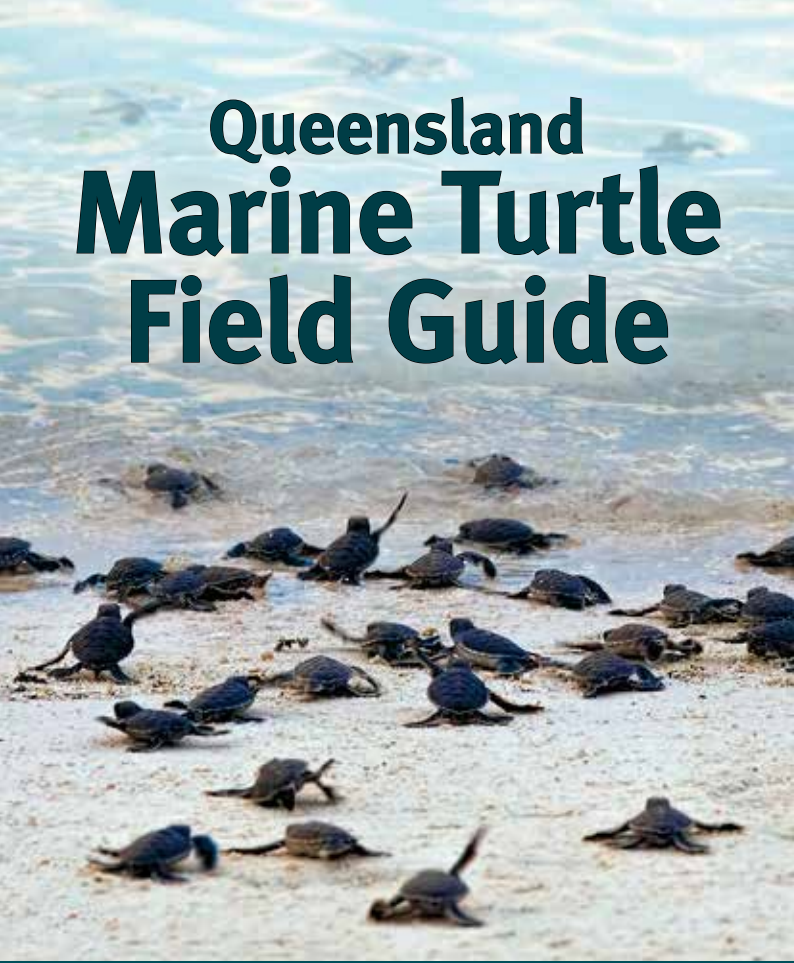


Figure 14. *Schematic representation of percentage cover categories.*

Queensland Marine Turtle Field Guide



Nest to Ocean
Turtle Protection Program

Australian Government

Queensland Government


APN

Queensland's coast has some of the most important marine turtle nesting sites in the world. Six species of threatened marine turtles nest along our idyllic beaches. These rookeries support significant nesting populations of green, loggerhead, hawksbill, flatback and olive ridley turtles.

One of the most serious threats to nesting turtle populations is the destruction of their eggs and hatchlings by predators. Feral pigs have been found to be responsible for destroying over 70 per cent of turtle nests at nesting beaches on Cape York, continued loss at this rate is not sustainable. Other predators include foxes, dogs, dingoes and goannas.

To reduce predation on marine turtle nests and help the recovery of threatened marine turtle populations, the Australian and Queensland Governments have together invested nearly $7million in the Nest to Ocean Turtle Protection Program. The program supports predator control and turtle monitoring at priority nesting beaches. It also assists Traditional Owner and community groups to increase their participation in these important activities.

This field guide has been developed as part of the Nest to Ocean Turtle Protection Program. Correctly identifying marine turtles, and the animals that prey on their nests, provides valuable information about turtle populations and shows where predator control activities are most needed.

Nest to Ocean
Turtle Protection Program

Front Cover: Turtle hatchlings © K Jorgen
Inside Cover: Steven Marpoondin (APN Cape York) © *Brian Ross*

Contents

Marine Turtle Species Identification Key

Indo-Pacific Marine Turtles

Carapace with:
- No continuous ridges
- Large scales
- Claws on flippers

Carapace with:
- 5 distinct continuous ridges
- No large scales
- No claws on flippers

Leatherback Turtle
Dermochelys coriacea

4 pair costal scales | 5 pair (rarely 6) costal scales | 6 pair or more costal scales

Carapace longer than wider
Red-brown to brown
No pores in scale of bridge

Loggerhead Turtle
Caretta caretta

Carapace more circular
Grey-green
Pores in scale of bridge

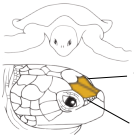
Olive Ridley Turtle
Lepidochelys olivacea

2 pair prefrontal scales
Thick overlapping carapace scales

2 pair prefrontal scales

Hawksbill Turtle
Eretmochelys imbricata

1 pair prefrontal scales
No thick overlapping carapace scales

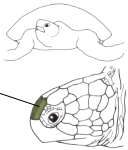


1 pair prefrontal scales

Preocular scales

Low domed carapace with upturned edges
Preocular scales
Olive grey

Flatback Turtle
Natator depressus



High domed carapace
No preocular scales
Light to dark green with dark mottling

Green Turtle
Chelonia mydas

Photographs of Adults and Hatchlings

Green Turtle *Chelonia mydas* Page 10

Olive Ridley Turtle *Lepidochelys olivacea* Page 14

Hawksbill Turtle *Eretmochelys imbricata* Page 18

Loggerhead Turtle *Caretta caretta* Page 12

Flatback Turtle *Natator depressus* Page 16

Leatherback Turtle *Dermochelys coriacea* Page 20

Marine Turtle Track Identification Key

Alternating Stroke

Flipper marks alternate

Track Features

Early morning monitoring is best as tracks will deteriorate over time. The clarity of tracks can be affected by flipper damage, terrain, sand moisture, tides, wind and weather. Look for several key identifying features, along different sections of track.

The key track identification features are:

- Stroke Style
- Track Width
- Hind Flipper Marks
- Front Flipper Marks
- Plastron Drag
- Tail Drag

Loggerhead

Track Width
Less than 1 meter

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag
Not present

Hawksbill

Track Width
Approx. 70-80 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Olive Ridley

Track Width
Approx. 70-80 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Breast Stroke

Flipper marks side by side

Green

Track Width
Approx. 94-144 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Flatback

Track Width
Approx. 90-100 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Leatherback

Track Width
Greater than 2 meters

Hind Flipper

Front Flipper

Plastron Drag
Not Visible

Tail Drag

Track Direction

Clues to determine track direction:

Turtles push sand backwards, the higher sand mound is at the back.

If track overlaps, the top track is the returning track.

Sand is always thrown back over the emerging track when digging.

Measuring Width

Measure from outer edge of track. This may be the front or rear flipper, depending on species.

Basic Beach Monitoring

Guidelines on how to **Record** data and implement **Action** during a basic beach survey (see page 9). These may be tailored to suit individual monitoring programs and implemented in accordance with training.

Record

Species Identification: Use track or sighting to identify species.

GPS Nest Location: Note GPS coordinates & waypoint number.

False Crawl: Track with no nest.

Extent of Damage: Partial or complete destruction of nest.

Evidence of Predation: Diggings, tracks, sighting.

Predator Identification: Use track or sighting to identify species.

Hatchlings Emerged: Yes, hatchling tracks or sighting.

Tag Information: Note tag ID number and its location on turtle.

Curved carapace length (CCL): From front (where skin and carapace meet), down midline to back edge of carapace (over tail).

Action

Photograph: To verify species and/or nest damage/predation.

Mark Nest: Install marker to indicate nest location (if required).

Bury Eggshells and Mark Track: To avoid record duplication; mark track line above the high tide mark.

Submit Data: Project manager to submit data to the relevant Queensland Department.

Basic Beach Survey

Traverse beach to locate fresh turtle tracks.
Walk along the high tide line or drive on the wet sand just below the high tide mark

Equipment Checklist

- GPS (Use datum WGS 84 and decimal degrees)
- Data sheets or charged data recording device
- Pencil
- Tape measure
- Camera
- Personal safety gear
- Torch (night monitoring)
- Spare batteries
- Monitoring field guide

Record fresh tracks only

Adult Track No nesting turtle

Identify Species

refer to **Track Identification** (Pages 6-7)

Is there a nest or is it a false crawl?

Nest

Record / Action
- Species ID
- GPS Nest Location
- Mark Nest

Is nest damaged?

No

Yes

Record / Action
- Extent of Damage
- Evidence of Predation
- Predator ID (refer to pages 22-25)
- Photograph
- Bury Eggshells

False Crawl

Record / Action
- Species ID
- False Crawl

Unsure

Record / Action
- Species ID
- GPS Nest Location
- Mark Nest
- Photograph

Adult Track Nesting turtle

Identify Species

refer to **Species Identification** (Pages 3-5, 10-21)

Once female has settled into laying or has completed nesting

Record / Action
- Species ID
- Tag Information
- Curved carapace length
- GPS Nest Location
- Mark Nest

Hatchling Tracks Hatchlings

Identify Species

if hatchling present refer to **Species Identification** (Pages 3-5, 10-21)

Record / Action
- Species ID
- Hatchlings Emerged
- Marked Nest ID or GPS Nest Location
- Evidence of Predation
- Predator ID (refer to pages 22-25)

Refer to Page 8 for Record / Action monitoring protocols

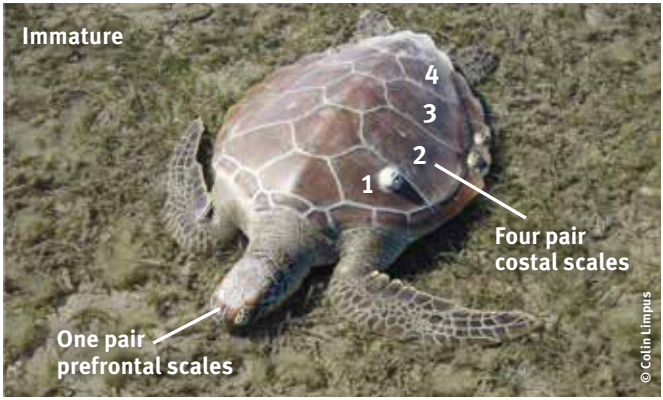
Mark monitored track with a line, above high tide mark, so it's not recorded twice

Continue and complete survey

Submit data forms and photographs for verification to project manager

Green Turtle, *Chelonia mydas*

Status: Nationally Vulnerable, Queensland Vulnerable



Key Identification Features

Breast Stroke Track

Carapace Scales

4 Pair Costal Scales

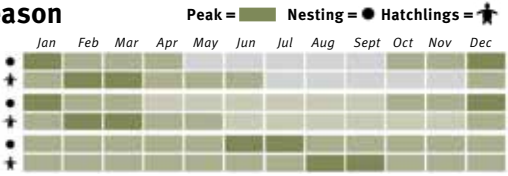
1 Pair Prefrontal Scales

Qld Nesting Sites

Adult: *Carapace is a high dome. Colour is light to dark green with dark mottling. Plastron colour is cream-white.*

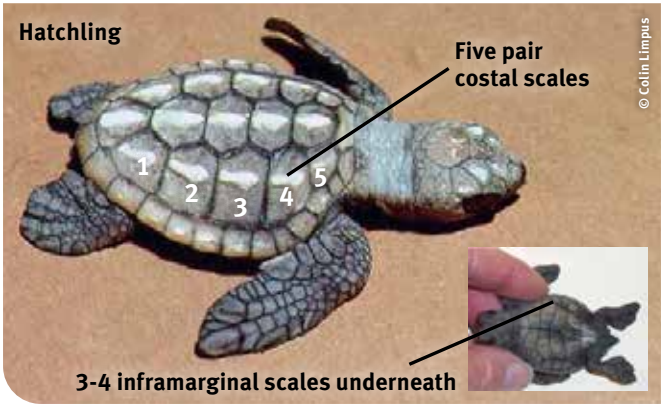
Hatchling: *Black-dark brown with white margins, white plastron.*

Breeding Season



Loggerhead Turtle, *Caretta caretta*

Status: Nationally Endangered, Queensland Endangered



Key Identification Features

Alternating Track

Carapace Scales

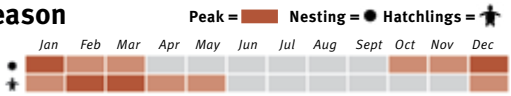
5 Pair Costal Scales

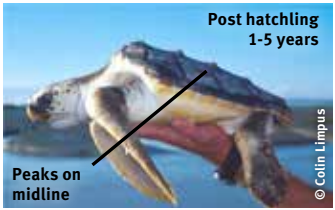
Qld Nesting Sites

Adult: *Carapace is longer than wider. Colour is red-brown to brown. Plastron colour is yellow.*

Hatchling: *Dark brown with 5 costal scales and dark plastron with 3-4 inframarginal scales.*

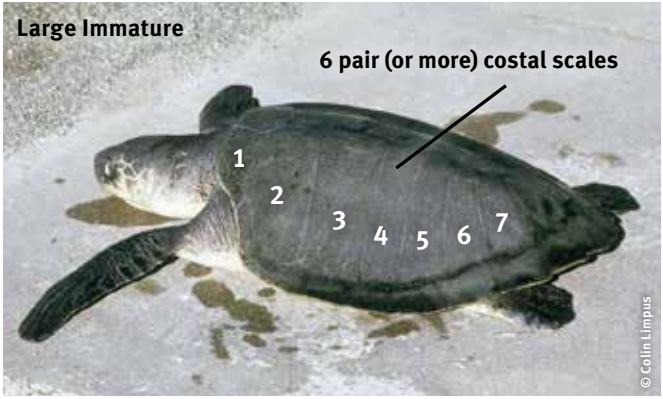
Breeding Season





Olive Ridley Turtle, *Lepidochelys olivacea*

Status: Nationally Endangered, Queensland Endangered

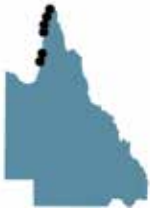


Key Identification Features

Alternating Track

Carapace Scales

6 Pair (or more) Costal Scales

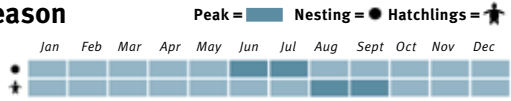


Qld Nesting Sites

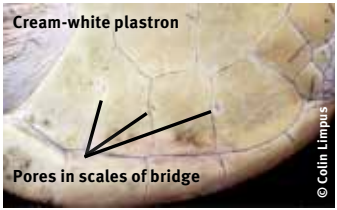
Adult: *Carapace is circular. Colour is grey-green with no conspicuous markings. Plastron colour is cream-white.*

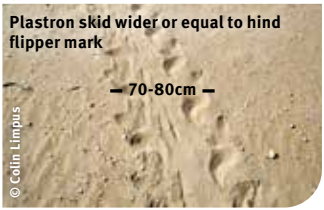
Hatchling*: Charcoal-grey/black-brown on both sides.*

Breeding Season



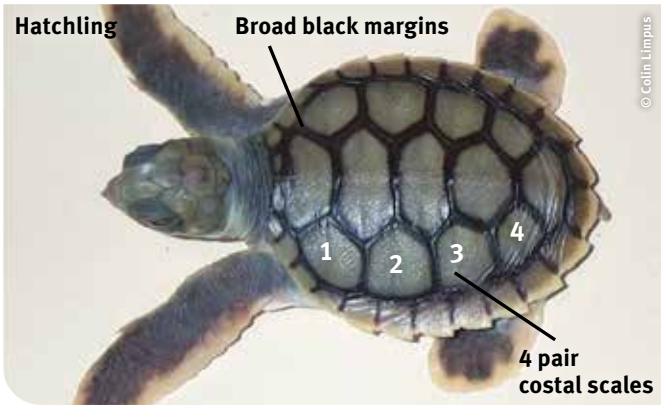
All year, peaks during dry season.





Flatback Turtle, *Natator depressus*

Status: Nationally Vulnerable, Queensland Vulnerable



Key Identification Features

Breast Stroke Track

Carapace Scales

4 Pair Costal Scales

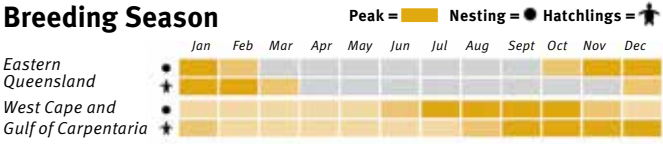
1 Pair Prefrontal Scales

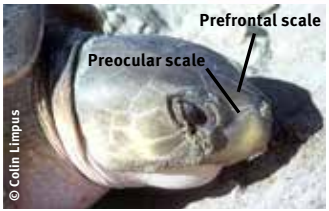
Qld Nesting Sites

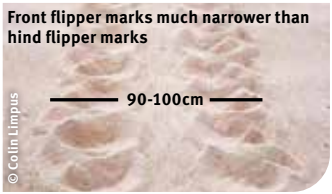
Adult: *Carapace is a low dome, smooth with upturned edges. Colour is grey to pale-grey or olive. Preocular scales. Plastron is creamy-yellow.*

Hatchling: *Olive-green, scales with broad black margin. Plastron is a solid white.*

Breeding Season

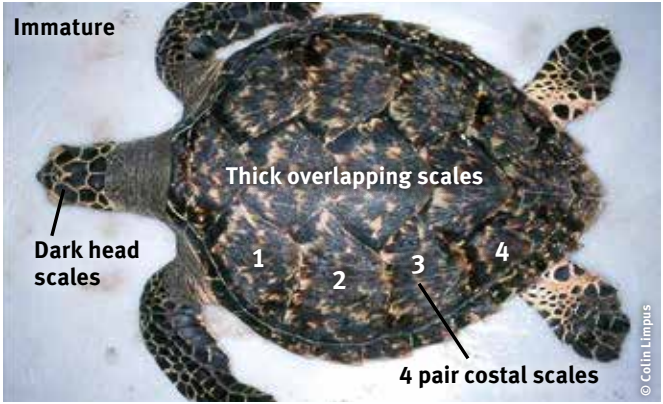


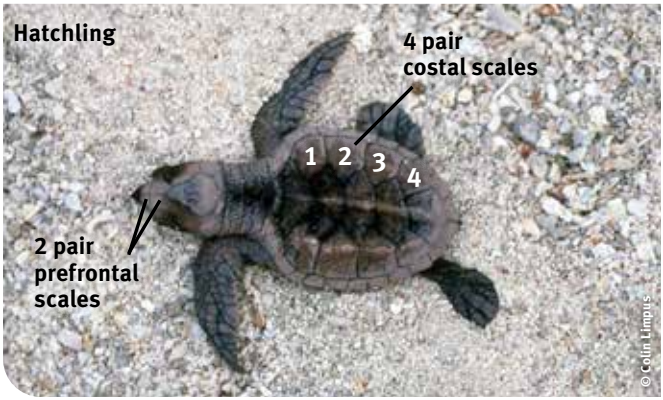




Hawksbill Turtle, *Eretmochelys imbricata*

Status: Nationally Vulnerable, Queensland Vulnerable





Key Identifcation Features

Alternating Track

Scales Thick Overlapping

4 Pair Costal Scales

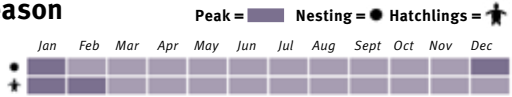
2 Pair Prefrontal Scales

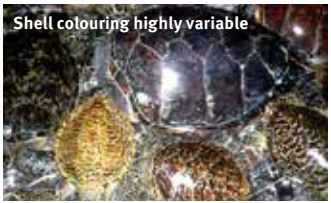
Qld Nesting Sites

Adult: *Carapace has thick overlapping scales. Colour is olive green or brown and is extensively variegated with brown/black markings. Adult plastron is yellow or white with black spots.*

Hatchlings: *Dark brown.*

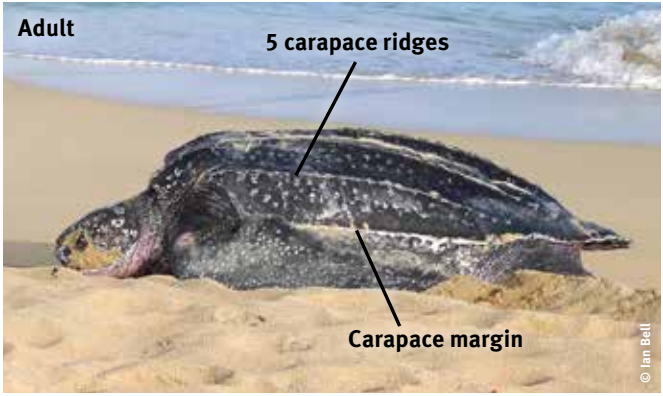
Breeding Season

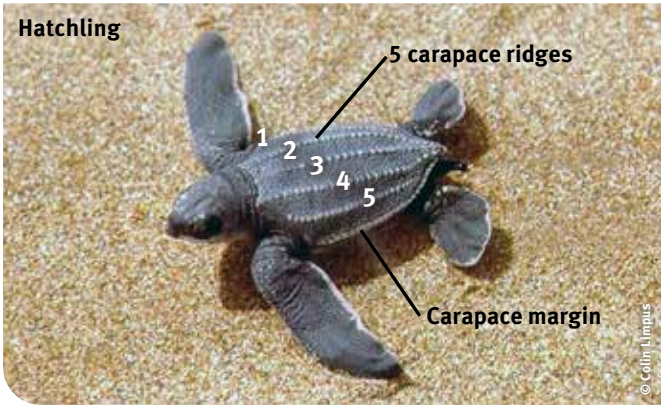




Leatherback Turtle, *Dermochelys coriacea*

Status: Nationally Vulnerable, Queensland Endangered





Key Identification Features

Breast Stroke Track

No Carapace Scales

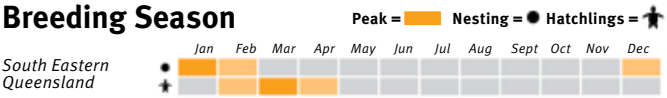
5 Carapace Ridges

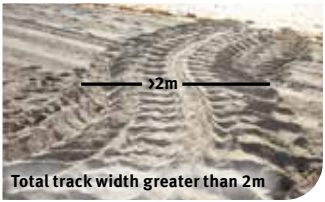
Qld Nesting Sites

Adult: *Carapace is long and pointed. Long ridges run down the length of carapace. Colour is a uniform black-brown. Soft leathery skin.*

Hatchlings: *Finely beaded, black with white markings on the carapace ridges and plastron.*

Breeding Season

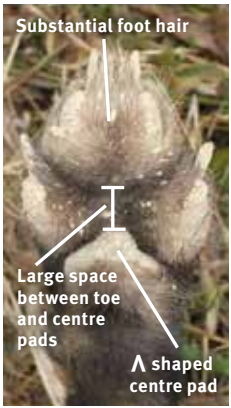




Fox

Track Identification Features

- Front foot is larger than back foot.
- Elongated oval shaped claws, may not show on track.
- Substantial foot hair, sometimes visible on track impression.
- Large space between centre pad and toe pads.
- Centre pad has a distinct inverted V shape.
- Tracks are straight, hind feet reusing front feet impressions.
- Small track width.



Management Options

- Den detection and fumigation
- Ground shooting
- Trapping
- Baiting
- Exclusion fencing
- Nest protection (cages)

Wild Dog or Dingo

Track Identification Features

- Front foot is larger than back foot.
- Little or no foot hair in between pads.
- Small space between centre pad and toe pads.
- Centre pad almost triangular.
- Foot imprint rounded.
- Tracks are straight but not as neat and aligned as a fox's track.

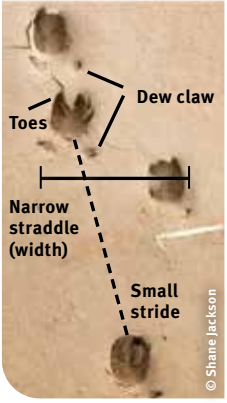
Management Options

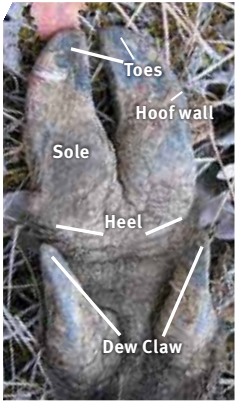
- Ground shooting
- Leg hold trapping
- Baiting (1080 or strychnine)
- Exclusion fencing
- Nest protection (cages)

Feral Pig

Track Identification Features

- Back feet slightly larger than front.
- Foot print consists of a two toe hoof and two dew claws.
- Dew claws distinctive identification feature but may not be present in harder soils.
- Small stride and narrow straddle.





Management Options

- Ground/aerial shooting
- Trapping
- Baiting
- Exclusion fencing
- Nest protection (cages)

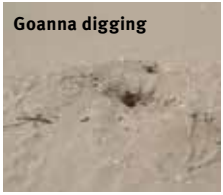
Goanna

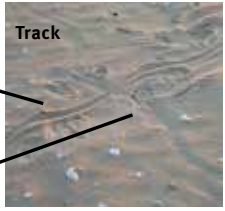
Track Identification Features

- Both walk and run tracks have alternating foot prints.
- Trail drag usually visable.

Nest Predation Identification

- Goannas burrow into nest at an angle from the side of the nest, not vertical from directly above.
- The burrow is typically domed shape, not circular.





Management Options

- Trapping
- Exclusion fencing
- Nest protection (cages)

Principles of Pest Management

Managing pest animals requires long-term control programs and a variety of approaches. Effective programs are designed around these eight principles:

1. INTEGRATION

Ensuring pest management programs are an integral part of the management of natural areas.

2. PUBLIC AWARENESS

Raising public awareness and knowledge of pests to increase community and individual participation in pest management.

3. COMMITMENT

Gaining a commitment to long term programs by the community, industry groups and government entities.

4. CONSULTATION AND PARTNERSHIP

Establishing partnerships between local communities, industry groups, state government agencies and local governments to achieve a collaborative approach.

5. PLANNING

Consistent planning at local, regional, state and national levels ensures combined resources target the agreed priorities.

6. PREVENTION

Preventing the spread of pests, and using early detection and intervention to control pests.

7. BEST PRACTICE

Using ecologically and socially responsible pest management practices to protect the environment and natural resources.

8. IMPROVEMENT

Research and regular monitoring and evaluating of programs helps improve and refine pest management practices.

Threats to Marine Turtles

Marine turtles are long-lived and slow to mature. Depending on the species they can take anywhere between 8–50 years to reach breeding age. Due to the range of threats, at their different life stages, it is thought that only 1 in 1000 hatchlings will survive to adulthood and then return to the beach to nest. For this reason it is critical to address the range of threats throughout their lifecycle.

Threats include:

- Native and introduced animals predating turtle eggs and hatchlings.
- Vehicles compacting turtle nests or forming tyre ruts that trap hatchlings.
- Humans taking turtle eggs.
- Bycatch of marine turtles in fisheries.
- Marine debris.
- Impact to breeding habitat from coastal development and artificial lighting.
- Deteriorating water quality.
- Unknown and possibly unsustainable levels of turtle harvesting, in and outside Australian waters.

What you can do:

- Support the management of predators such as pigs, dogs and foxes around turtle nesting beaches.
- Report turtle nests and predated turtle nests to your local ranger.
- Keep your dogs on a lead when walking on the beach during nesting/hatchling season.
- Drive slowly on beaches and avoid driving over nests. Drive on the wet sand below the high tide mark to avoid making wheel ruts.
- Pick up marine debris from the beach and waterways.
- Report ghost nets to your local ranger.
- At night, minimise lights on the beach, including campfires.
- Support sustainable, traditional use of adult turtles and turtle eggs.

Acknowledgements

The Queensland Parks and Wildlife Service Nest to Ocean Turtle Protection Program Team would like to acknowledge the contribution of staff from the following organisations in the development of the field guide: Western Cape Turtle Threat Abatement Alliance supported by Cape York Natural Resource Management, Balkanu Cape York Development Corporation, Aak Puul Ngantam, Feralfix, World Wildlife Fund for Nature, and University of Queensland. Also acknowledged is the input and advice of staff from our partnering Australian and Queensland Government departments.

References

Biosecurity Act 2014 (Qld)

Cape York Sea Turtle Project Turtle: Track Monitoring Manual. (Cape York Sustainable Futures)

Limpus, C. J. (2008). *A Biological Review of Australian Marine Turtles. 1. Loggerhead Turtle Caretta caretta (Linnaeus)*. (Queensland Government Environmental Protection Agency: Brisbane.)

Limpus, C. J. (2008). *A Biological Review of Australian Marine Turtles. 2. Green Turtle Chelonia Mydas (Linnaeus)*. (Queensland Government Environmental Protection Agency: Brisbane.)

Limpus, C. J. (2009). *A Biological Review of Australian Marine Turtles. 3. Hawksbill Turtle Eretmochelys Imbricata (Linnaeus)*. (Queensland Government Environmental Protection Agency: Brisbane.)

Limpus, C. J. (2008). *A Biological Review of Australian Marine Turtles. 4. Olive Ridley Turtle Lepidochelys Olivacea (Eschcholtz)*. (Queensland Government Environmental Protection Agency: Brisbane.)

Limpus, C. J. (2007). *A Biological Review of Australian Marine Turtles. 5. Flatback Turtle Natador Depressus (Garman)*. (Queensland Government Environmental Protection Agency: Brisbane.)

Limpus, C. J. (2009). *A Biological Review of Australian Marine Turtles. 6. Leatherback Turtle Dermochelys Coriacea (Vandelli)*. (Queensland Government Environmental Protection Agency: Brisbane.)

Limpus, C. J. (1992a). *Indo-Pacific Marine Turtle Identification Key.* (Queensland Department of Environment and Heritage, Brisbane.)

Markovina, K. (2015) *Turtle Monitoring Field Guide (Edition 7)*. (Western Australian Government Department of Parks and Wildlife.)

Nest to Ocean Turtle Protection Program: 2014 to 2018 Improving Turtle Nest Success Through Predator Control. Queensland Government Department of National Parks, Recreation, Sports and Racing, Queensland Parks and Wildlife Service (2014).

CC BY

Prepared by:
Queensland Parks and Wildlife Service,
Department of Environment and Science.

©State of Queensland, 2016.

Green Turtles on Raine Island © Duncan Limpus

©State of Queensland 2016.
Queensland Parks and Wildlife Service,
Department of Environment and Science.
Bp2147 June 2016