2021
St Helens Beach Local Coastal Plan

Mackay Regional Council

Reef Catchments

Acknowledgements: This project is supported by Reef Catchments through Mackay Regional Council's *Natural Environment Levy.* Local Coastal Plans are based on Mackay Regional Council's *Coastal Management Guidelines* (MRC 2012). Technical geomorphic assessment of the *St Helens Beach Local Coastal Plan* area was provided by Alluvium. Council acknowledges the significant efforts of the St Helens Beach community in informing and contributing to the development of this plan.

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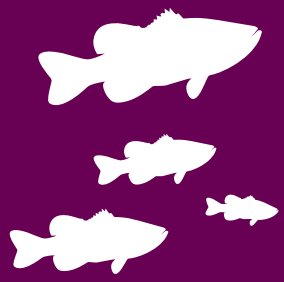
ST HELENS BEACH COASTAL UNIT INCLUDES **2.5km** OF COASTLINE

THE MANGROVE COMMUNITIES OF ST HELENS BEACH PROVIDE IMPORTANT ENVIRONMENTAL SERVICES INCLUDING **HABITAT FOR JUVENILE FISH**, **SEDIMENT TRAPPING** AND **CARBON SEQUESTRATION**

STRONG ***COMMUNITY RELATIONSHIPS***

ST HELENS BEACH IS A ***NET-FREE*** FISHING LOCATION



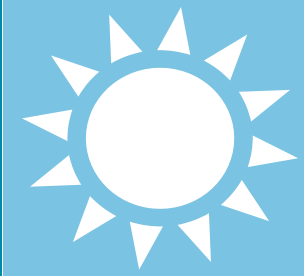
ST HELENS BAY IS A ***NATIONALLY IMPORTANT WETLAND***

ST HELENS BEACH IS AN IMPORTANT ***SHOREBIRD*** ROOSTING AREA

TRADITIONAL OWNERS PREVIOUSLY OCCUPIED THE ST HELENS BEACH AREA. ***ITEMS OF CULTURAL SIGNIFICANCE ARE KNOWN TO BE PRESENT IN THE AREA***

COASTAL DUNE SYSTEMS PLAY A ***CRUCIAL ROLE*** IN THE ECOSYSTEM. VEGETATION IS CRITICAL TO DUNE FORMATION AND STABILISATION.

THE COASTAL UNIT CONTAINS ESSENTIAL HABITAT FOR COASTAL SHEATHTAIL BATS



ST HELENS BEACH IS A POPULAR CAMPING AND OUTDOOR RECREATION AREA

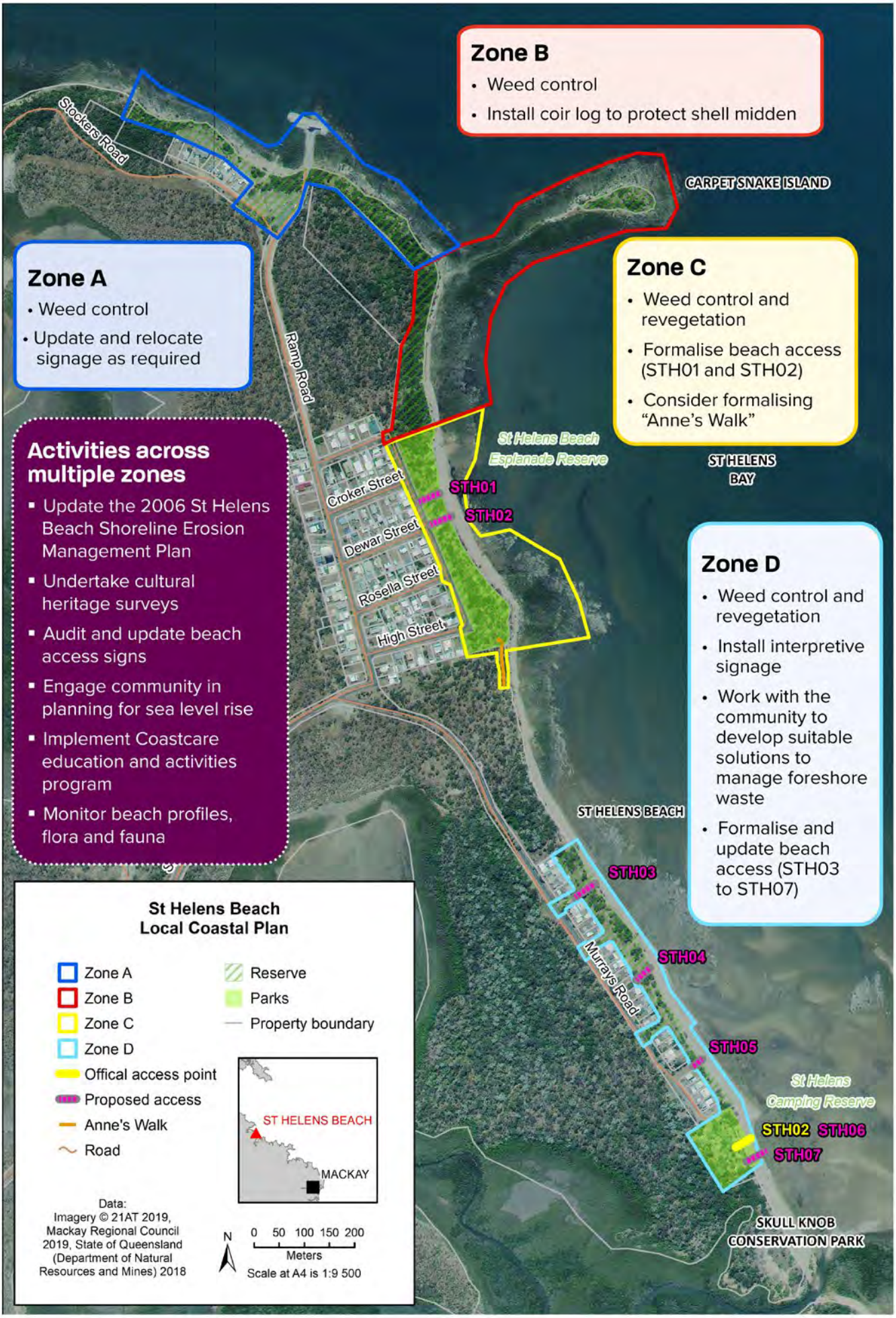


Figure 1: *Visual summary of recommendations.*

1 Executive Summary

St Helens Beach is a small, coastal, residential settlement located approximately 50km north-west of Mackay. Mackay Regional Council (MRC) (hereafter referred to as council) manages its coastal land at St Helens Beach through an integrated program of planning, on-ground works, monitoring and community engagement known as the *Coasts and Communities Program.* As part of this program, *Coastal Management Guidelines* (MRC 2012) have been developed to provide a framework for management decisions and activities for coastal land under council's jurisdiction. Individual Local Coastal Plans, such as this plan for St Helens Beach, provide site-specific recommendations for individual coastal units.

The *St Helens Beach Local Coastal Plan* describes the environmental and social values of the coastal unit, as well as the key threats and management issues. St Helens Beach has a small residential population of approximately 200 people (ABS 2018) living on the beachfront. A rocky, mangrove-fringed point forms the northern boundary of the coastal unit, just north of a small housing settlement. At the southern point of the coastal unit lies Skull Knob Conservation Park. The beach roughly lies in a north-south alignment in the lee of Rabbit Island, located approximately 5km offshore. The sandy beach slopes down to large intertidal mudflats and is well protected from waves through its proximity to Rabbit, High and Brother Islands, the nearby reef, and its location between Skull Point and Carpet Snake Point headlands (Short and McLeod 2000). Large sandy tidal flats, rock flats and mangrove communities front the beach and provide habitat for resident and migratory shorebirds. A diverse composition of vegetation communities exist throughout the coastal unit and surrounding landscape. Mangroves occur around the northern headland and creek areas, and *Eucalyptus* woodlands dominate the remaining area, providing Essential Habitat for a range of threatened species including the vulnerable mangrove mouse (*Xeromys myoides)* and near-threatened coastal sheathtail bat (*Taphozous australis*).

Key pressures within the coastal unit include climate change, sea level rise, erosion, loss of native vegetation, incursion of non-native vegetation and loss of the coastal strip which serves as a buffer between the southern residential settlement and the beach itself. Recommendations to manage these threats include updating the *St Helens Beach Shoreline Erosion Management Plan* (SEMP) (Andrews 2006), weed control, revegetation, and ongoing engagement with the community to plan for the impacts of sea level rise associated with climate change (Figure 1).

Social values are also described and opportunities to improve recreational facilities and values have been identified, including access management and cultural heritage signage. The recommended activities will be implemented on a prioritised basis as resources become available.

Community engagement is recognised as a critical part of the success of on-ground works and opportunities for the community to learn about coastal ecosystems and get involved in management activities at St Helens Beach will be provided through the Coastcare program.

The activities recommended in this Local Coastal Plan (Table 2) will help protect and improve the condition of assets in the coastal unit, ensuring that best-practice management principles are implemented, and on-ground activities are prioritised and undertaken in a coordinated and strategic way. This plan will help attract additional funding to the region (including from State and Federal sources) to protect coastal resources and improve recreational opportunities for our community.

Key recommendations include:

- Weed control across all zones, targeting major weeds including common sensitive weed, Guinea grass, lantana and Singapore daisy.
- Formalise and update beach access points STH01 to STH07.
- Implementing dune rehabilitation strategies to improve the retention of sand along St Helens Beach, with community involvement.
- Work with the community to plan, develop and commence a program of staged vegetation rehabilitation activities to enhance coastal vegetation and remove weed species in partnership and with agreement of the community.
- Assisting natural regeneration of native species within St Helens Beach Esplanade Reserve and along the foredune in front of Wootaroo Esplanade leaving the existing open space intact in both areas.
- Working with the community to develop suitable solutions to manage palm frond waste.
- Installing regulatory, cultural and interpretive signage where appropriate.
- Investigating additional recreational opportunities, such as formalising Anne's Walk and maintain the facilities within St Helens Camping Reserve in the immediate term.
- Engaging and empowering local community members through community engagement events and working bees.
- Engaging the St Helens Beach community to update the *2006 Shoreline Erosion Management Plan.*

2 Introduction

Council has a major role to play in the management of public coastal lands. Council is responsible for the public land along the coast including Esplanade, Reserves and areas zoned as Open Space. The *Coastal Protection and Management Act 1995* and associated *Queensland Coastal Plan* (DEHP 2013a) underpin coastal management in Queensland and along with multiple other pieces of State and Federal legislation and council's own *Local Laws* and *Coastal Management Guidelines* (MRC 2012), direct the management of these public coastal areas.

The *Coastal Management Guidelines* recognise that the coast is characterised by a diverse range of natural features including: sandy beaches, rocky headlands, rainforest, woodland, grassland, extensive intertidal flats and substantial areas of coastal wetland. The Mackay coastline is a dynamic and forever changing landscape, shaped and formed by a range of factors including wave action, changing tides, predominant winds and human influences. Mackay also has a large tidal range that exceeds six metres (EPA 2004).

The Mackay region is prone to severe storm events and tropical cyclones that impact coastal areas causing localised erosion. After a storm some areas recover quickly. However, if there is not enough time for adequate recovery before another storm event or if the coastline is a predominantly eroding coast, the impacts of erosion can accumulate, altering the shape of the coastline over time.

Management options to improve the resilience of coastal areas to future storm events are available. Maintaining a sufficient buffer of vegetated dune or other coastal ecosystems such as mangrove acts to bind and retain sediment in coastal areas. The *Mackay Coast Study* (EPA 2004) describes the need to protect coastal areas not only for their importance as assets to tourism and recreation, *but also as the maintenance of wide sandy beaches and well-vegetated dune systems provides a natural barrier to storm wave energy and protects inland areas against extreme water levels* (EPA 2004 p.4). Effective coastal management can therefore be viewed as a risk mitigation strategy.

Within the region, development has occurred in some areas that are prone to erosion (EPA 2004). Some areas are already seeing changes in their local coastlines. With future predicted increases in sea level rise and more extreme weather events including cyclones, there is an increasing need to forecast the impact on coastal areas and plan effective, achievable action for protection of coastal values, including:

- The safety and longevity of communities - this includes property, infrastructure and services required for healthy communities.
- Meeting of recreational needs - many locals and visitors utilise coastal areas for activities that add to their health, provide relaxation and offer opportunities to enjoy nature.
- Continuity of economic services - fisheries and tourism rely heavily on healthy and attractive coastal areas.
- Environmental values – the provision of ecosystem services relies upon healthy coastal vegetation communities and natural environmental processes. Marine turtles and shorebirds require sandy beaches and healthy dune systems for nesting and feeding and many other native flora and fauna require coastal areas for habitat and food.

Adaptation options for coastal areas need to be well considered to ensure the region as a whole is best placed for the future. Maladaptation can occur when proper planning and best science are not incorporated into decision-making processes.

Council manages coastal areas through an integrated program of planning (i.e. Local Coastal Plans (formerly Beach Plans), on-ground works, monitoring and community engagement known as the Coasts and Communities Program (Figure 2). The aim of the Coasts and Communities Program is to protect coastal ecosystems in the Mackay region and, where opportunities exist, restore these areas to enhance their biodiversity values, whilst allowing for appropriate recreational access and use.

Visit *www.mackay.qld.gov.au/environment/natural_environment/coastal_management* for more information on the program.

Historically, strong emphasis has been on the protection, conservation, rehabilitation and management of the coastal unit and its biological diversity. Actions implemented over past years include:

- Construction and maintenance of two rock groynes.
- Construction and maintenance of a boat ramp.
- Expansion and maintenance of the boat ramp and associated car park.
- Maintenance of St Helens Beach Esplanade Reserve.
- Maintenance of St Helens Camping Reserve.

The objectives of this Local Coastal Plan are to:

- Identify the values and pressures in the coastal unit.
- Develop strategies to guide the long term protection of the natural coastal environment of St Helens Beach.
- Identify recreational opportunities within the coastal unit.

Council is committed to ensuring that communities are well informed throughout the process of Local Coastal Plan development.

Mackay *Coasts and Communities Program* implementation model

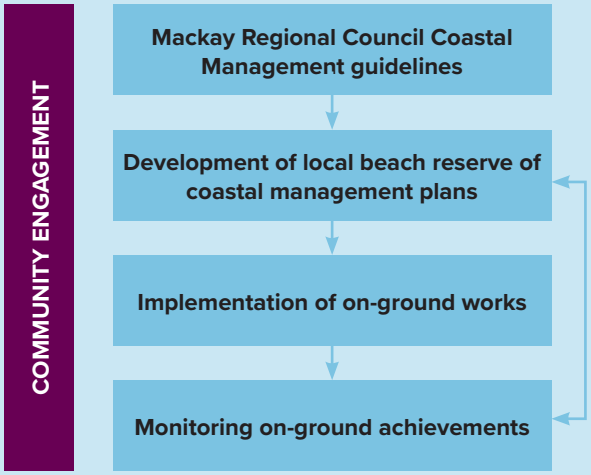


Figure 2: *Mackay Coasts and Communities program Implementation Plan.*

STATUTORY OBLIGATIONS

There are a range of statutes at the Regional, State and Federal level that are relevant to, and may guide the management of natural resources and recreation within the Mackay area. These are shown in Figure 3.

FEDERAL GOVERNMENT

- *Biosecurity Act 2015* provides management principles for diseases and pests that may cause harm to human, animal or plant health or the environment, and for other related purposes.
- *Environmental Protection and Biodiversity Conservation Act 1999* provides a high level of protection for Matters of National Environmental Significance (MNES). In particular it provides protection for important populations of migratory species.
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for the preservation and protection of areas and objects in Australia and in Australian waters that are of particular significance to Aboriginals in accordance with Aboriginal tradition.

INTERNATIONAL AGREEMENTS

- *China and Australia Migratory Bird Agreement (CAMBA),* the *Japan and Australia Migratory Bird Agreement (JAMBA),* and the *Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)* provide for conservation of shorebirds (waders) across the migratory flyway for these species.

STATE GOVERNMENT

- *Land Act 1994* provides for the designation of the reserves and assignment of Trustees for the protection of environmentally and culturally valuable and sensitive areas and features.
- *Recreation Areas Management Act 2006* provides for the establishment, maintenance and use of recreation areas; and aims to coordinate, integrate and improve recreational planning, recreational facilities and recreational management for recreation areas.
- *Vegetation Management Act 1999* provides management principles for vegetation within Queensland.
- *Coastal Protection and Management Act 1995 (Coastal Act)* provides a comprehensive framework for the coordinated management of the Queensland Coast, and establishes the Queensland Coastal Plan 2012 as the primary statutory instrument under the Coastal Act.
- *Nature Conservation Act 1992* provides management principles for wildlife within Queensland.
- *Native Title (Queensland) Act 1993* identifies the presence of Native Title over land.
- *Land Protection (Pest and Stock Route Management) Act 2002* provides the regulatory basis for control of pest species. In particular the Act classifies pest species and provides obligations for landholders.
- *Fisheries Act 1994* provides protection for marine plants including mangroves and saltmarshes, and provides the regulatory environment for control of recreational fishing activities.
- *Sustainable Planning Act 2009* provides the regulatory background for the development of planning schemes.
- *Environmental Protection Act 1994* regulates environmentally relevant activities, including release of emissions on land, air or water and noise.
- *Marine Parks Act 2004* regulates use of Marine Park to protect marine environment.
- *Waste Reduction and Recycling Act 2011* provides regulatory regime for management of litter and illegal dumping.
- *Queensland Coastal Plan 2012* provides policy guidance to coastal land managers including best practice coastal management principles which support the development of local management plans.

LOCAL GOVERNMENT

- *Mackay Regional Council Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads) 2011* provides for the management of council controlled lands by enabling the prohibition of vehicle access and protection of vegetation and infrastructure.
- *Mackay Regional Council Local Law No. 2 (Animal Management) 2011* provides for the management of animals in the natural environment, including ensuring that they are under effective control and requiring removal of faeces in a public place.
- *Coastal Management Guidelines 2012* provides a framework for management decisions and activities for land under Mackay Regional Council jurisdiction in the coastal zone.
- *Mackay Regional Council Planning Scheme Open Space Strategy No. 12* outlines Mackay Regional Council's committment to provide a balanced mix of public open space that in turn will provide for a range of active and passive recreational opportunities for the community.
- *Reef Guardian Council program* recognises council's commitment to protect, conserve and enhance the values of the Great Barrier Reef for future generations through effective and responsible land-based management practices. The *Coasts and Communities Program* is a key initiative under this program.

Figure 3: *Regulatory framework.*

3 Coastal Unit Description

St Helens Beach is approximately one hour's drive north from the Mackay city centre. The coastal unit covers two stretches of sandy foreshore, separated by a rocky outcrop and Carpet Snake Island. A low, rocky, mangrove-fringed point forms the northern boundary of the coastal unit, and the southern end abuts Skull Knob Conservation Park and a small creek locally referred to as Sandfly Creek (Figure 4). There are three distinct residential settlements along St Helens Beach, each separated by remnant vegetation patches on State land parcels. Creek mouths to the north and south of the coastal unit empty into St Helens Bay, a Nationally Important Wetland (DEE 2019). As part of the broader St Helens Bay wetland area large sandy tidal flats, rock flats and mangrove communities front the beach.

The St Helens Beach coastal unit comprises 31.7ha of council-managed land, including Reserve tenure land, and State land for which council is the custodian (Figure 5). The coastal unit is zoned as Open Space in the Planning Scheme with the residential settlements zoned as Township and nearby Skull Knob Conservation Park zoned as Conservation. In the *Mackay Region Planning Scheme 2017* (MRC 2017a) the Township area has Freehold land tenure and Skull Knob Conservation Park has National Park tenure (Figure 6).

The coastal unit is separated into four management zones based on common management values and issues (Figure 1). Zone A includes the land within the coastal unit north of Carpet Snake Island. Zone B includes Carpet Snake Island and the Reserve tenure land north of Bennett Street. Zone C extends from Bennett Street to south of High Street and includes Anne's Walk. Zone D includes the Reserve tenure land in front of Wootaroo Esplanade and extends to St Helens Camping Reserve.

Approximately 21.8ha of remnant coastal vegetation occurs within the coastal unit and includes mangroves, tidal flats, woodlands and open forests. Threats to these vegetation communities include illegal dumping on the dunes, clearing, inappropriate access to the beach through dune vegetation due to lack of official access points, and weed invasion. Removal of vegetation, as well as the maintenance of open space has inhibited establishment of native vegetation and allowed for invasive weed species such as lantana (*Lantana camara*), Guinea grass (*Megathyrsus maximus*) and various garden escapees to colonise.

The beach is protected from waves through its proximity to Rabbit, High and Brother Islands, the nearby reef and its location between Skull Knob and Carpet Snake Point headlands (Short and McLeod 2000). However, there is a net loss of sediment from the system as predominant wind and waves drive sediment to the south. Little sediment input to the system from the north has led to erosion of the foreshore along the northern end of the coastal unit. Two offical groynes were engineered within Zone D of the coastal unit to reduce sediment loss. Erosion control groynes, seawalls and other barriers have also been constructed by local residents.

St Helens Beach is valued for its cultural history, and social and recreational values. The township is small and quiet, with a relaxed lifestyle. St Helens Beach offers a range of outdoor recreation opportunities including fishing and camping. St Helens Beach Boat Ramp (Zone A) provides direct access to popular fishing locations within St Helens Bay. Residents and visitors are offered further recreational opportunities within the St Helens Beach Esplanade Reserve, which contains open space, a play area and picnic facilities. There is also a council-managed camping area in the southern section of the coastal unit, providing facilities for travelling campers.

Figure 4: *Extent of St Helens Beach coastal unit.*

Figure 5: *Land tenure at St Helens Beach.*

Figure 6: *Planning scheme zonation at St Helens Beach.*

Figure 7: *Coastal management zones at St Helens Beach.*

The Mackay region is inshore from the Great Barrier Reef and activities must comply with the regulatory zoning conditions introduced by the Great Barrier Reef Marine Park Authority (GBRMPA) in 2004. Marine Park zoning is an important component of managing marine areas (GBRMPA 2011). The northern half of St Helen's Beach, including Carpet Snake Island and part of St Helens Bay, is within a Habitat Protection Zone (Blue Zone) (Figure 8). Habitat Protection Zones prohibit certain activities, such as trawling, to protect sensitive habitats in the Marine Park. Other high-impact activities, including tourism operations, shipping and harvest fishing for specific species require a permit, however low-impact, recreational activities including boating, crabbing and line fishing are permitted. Further offshore there is a Conservation Park Zone (Yellow Zone) stretching southward to Seaforth, and a Marine National Park Zone (Green Zone) stretching northward from Pigeon Island past Cave Island.

For additional details regarding zoning restrictions, visit the GBRMPA website: *www.gbrmpa.gov.au*

The coastal waters of St Helens Bay adjacent to St Helens Beach are also within a dugong protection boundary (green dashed line). Dugong (*Dugong dugon*), dolphins, turtles and other marine life can be tangled in nets, often causing death.

Dugong Protection Areas were established in Queensland in 1997, resulting in restriction on the use of nets in these areas to protect the species, which are listed as Vulnerable under the Queensland Government's Nature Conservation Act 1992. The area between the coast and the green dashed line is therefore under regulation by the Queensland Department of Agriculture and Fisheries. In 2015, additional restrictions were placed on gill netting operations with the establishment of a net-free zone, one of only three in Queensland. This net-free zone stretches from Dewars Point on the Stewart Peninsula, which is to the north of St Helens Beach, to Cape Hillsborough, with the purpose of protecting local fish stocks and improving recreational fishing opportunities, thereby supporting tourism and economic growth (Figure 9). In the 1930s to 1970s, fish traps located at St Helens Beach and Dewars Point were operated by "Bullocky" Brownsey, Stan Hold and the Bryan family. These fish traps no longer operate (Barron, Wales, Bennett, Birkett and Pratt 2020, pers. comm.).

For additional details regarding the net-free zone, visit *https://publications.qld.gov.au/dataset/maps-of-final-net-free-fishing-zones-in-queensland*

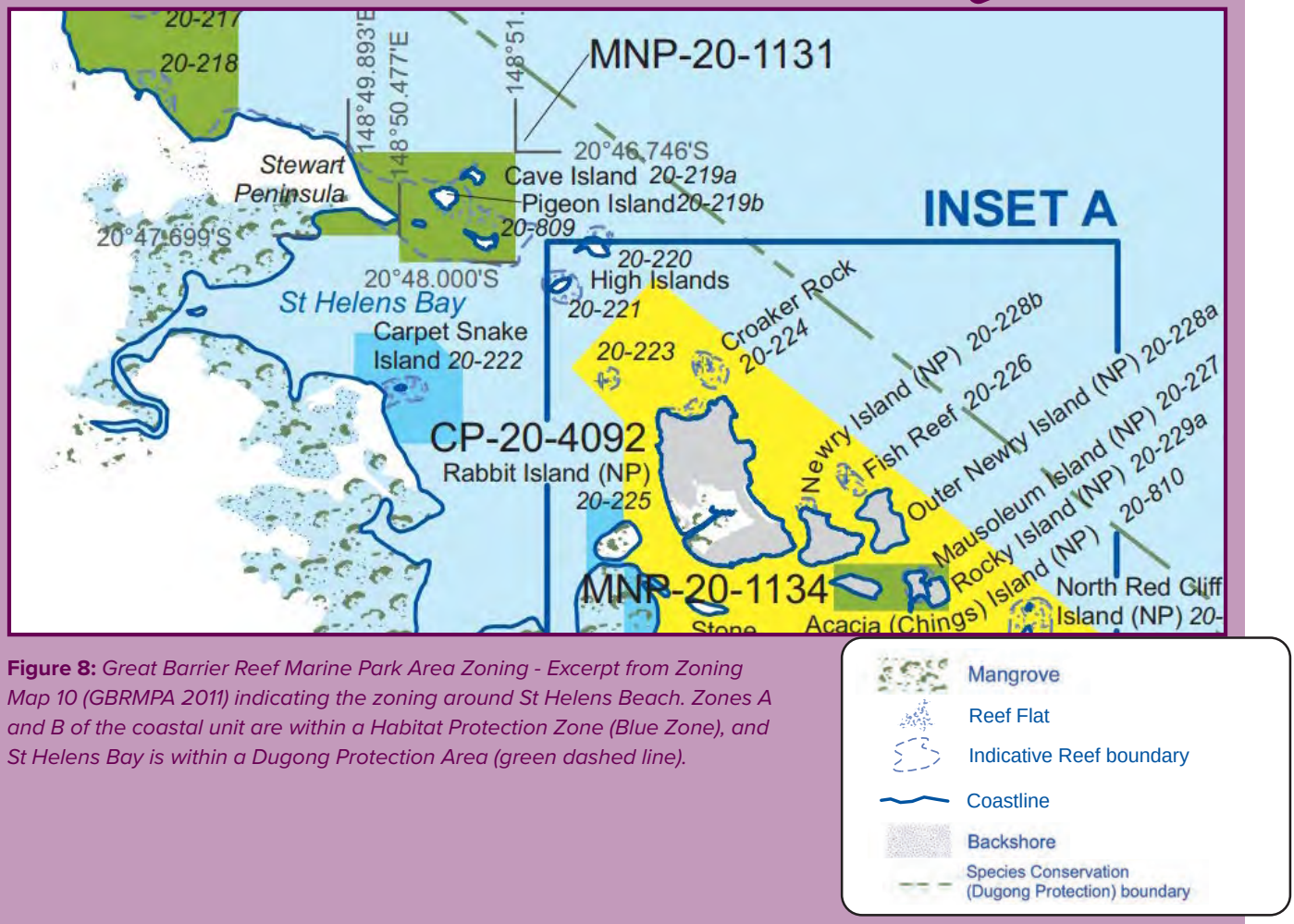


Figure 8: *Great Barrier Reef Marine Park Area Zoning - Excerpt from Zoning Map 10 (GBRMPA 2011) indicating the zoning around St Helens Beach. Zones A and B of the coastal unit are within a Habitat Protection Zone (Blue Zone), and St Helens Bay is within a Dugong Protection Area (green dashed line).*

4 Environmental Values and Management Issues

St Helens Beach coastline is dominated by remnant vegetation. Non-remnant sections reflect the loss of vegetation resulting from clearing for residential development, which was completed in 1990 (Figure 9). The ecological communities surrounding St Helens Beach coastal unit sustain important wildlife populations of Regional, State and National Significance. Tracts of remnant vegetation provide important stepping stones to allow native species to cross the landscape. In addition, the ecosystems are important in maintaining natural processes and providing ecosystem services to the local community and region. Carbon storage, water filtration, climate regulation, stabilisation of the shoreline, nutrient cycling and scenic and recreational values constitute just a few examples of the ecosystem services these areas provide to the local community.

This section outlines the distribution and significance of coastal vegetation and wildlife in the St Helens Beach area and its environmental values. The major threats and management issues relevant to the environmental values will be discussed, including dune systems and erosion processes.

4.1 VEGETATION

The vegetation component of this plan considers three important facets that define the integrity and condition of vegetation in the coastal unit.

Remnant vegetation is the historical vegetative cover of an area and is captured within official Regional Ecosystem mapping. It includes both woody and non-woody vegetation and is dominated by species characteristic of the vegetation's undisturbed canopy. Remnant vegetation is distinguished by the dominant canopy having greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum (Queensland Government 2016).

Vegetation zonation is the sequence of different vegetation communities or zones that occur along a coastline. The zones reflect changes in the nutrient and moisture content of dune soils, which increase in a landward direction, and changes in the degree of exposure to strong winds, salt spray and sandblast, which decrease in a landward direction (DEHP 2015). When vegetation communities are heavily disturbed, for example by weed encroachment or human activities, vegetation zonation is inhibited.

Non-native vegetation is discussed in terms of the weed species that are present and may require management.

4.1.1 Remnant vegetation

Remnant vegetation is mapped at a scale of 1:100,000 by the Queensland Government for legislative and management purposes (Queensland Government 2016). Regional Ecosystems (RE) are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The Regional Ecosystem Description Database describes each RE and lists both the biodiversity status and the Vegetation Management Class of each (Table 1). The biodiversity status is determined based on an assessment of the amount of a RE remaining (as a percentage of its historic range) and its condition, and is used to determine the Vegetation Management Class, under the *Vegetation Management Act 1999* (DEHP 2013b). A regional ecosystem is listed as Endangered, Of concern or No concern at Present/Least concern based on these factors. It is important to note that RE mapping provides no indication of the current condition of this vegetation at the local scale.

The importance of coastal vegetation includes, but is not limited to:

- Native dunal vegetation can provide a significant refuge and source of food for local and migratory fauna species.
- Existing native dunal vegetation provides a seed bank for future generations of vegetation, thereby protecting the natural biodiversity of the area.
- Native dunal grasses and groundcover facilitate dune growth by colonising and trapping windblown sand and preventing its escape from the beach system.

In coastal areas, vegetation can be scorched by high temperatures and salt, as well as abraded by windblown sand. Species that can withstand these effects benefit from onshore winds by intercepting wind-borne nutrients from the sea. These nutrients are deposited on the leaves of coastal plants and washed into the sand by the first showers of rain, thereby introducing nutrients to the system and allowing less hardy species to colonise the coastal area (Gold Coast City Council 2007).

In Queensland, approximately 80% of people live on the coast (DEHP 2013a). As a result, remnant coastal vegetation is often fragmented and subject to high levels of disturbance (Caton and Harvey 2010). Coastal development characteristically results in a loss of coastal vegetation, as it often facilitates disturbance throughout the coastal zone through mowing and/or clearing areas of vegetation for recreation. Coastal vegetation remnants, however, remain a critical part of the landscape, providing important ecosystem services, habitat corridors, and recreational values.

General principles for the conservation of remnant vegetation include:

- Providing suitable access points to the beach and facilities.
- Controlling weeds to allow native species to regenerate.

- Discouraging the dumping of garden and general waste.
- Encourage ground cover plants such as salt couch and goats foot vine to encourage build up and retention of sand.

Within the coastal unit there is 21.8ha of remnant vegetation, predominately within Zones A, B and C of the coastal unit (Table 1 and Figure 9). The majority of the vegetation within Zone D is in very poor condition as a result of development, erosion, weed incursion and former accesses leading to premises in the Wootaroo Esplanade area, and is therefore not considered remnant vegetation. Remnant vegetation in the coastal unit comprises more than 7ha of RE 8.12.20a, *Eucalyptus* woodland, and a 0.12ha patch of coastal she-oak and Moreton bay ash woodland (RE 8.2.6/8.2.2). However the majority of the remnant vegetation (14.67ha) is mangrove communities, RE 8.1.1.

Mangroves occur in the northern half of the coastal unit, throughout Zones A, B and C, extending south into the State land between Zone C and D. Mangrove communities continue to develop in Zone D. Mangrove estuarine wetlands (RE 8.1.1) serve as an important detention area and settling pond which helps improve water quality, nutrient and sediment loads entering the World Heritage Area, and provides good passage for fish migrations. They are also very important habitats for roosting shorebirds, as well as nurseries for reef fish species (Fukuda *et al*. 2007). Impacts are evident to the mangroves in Zone A however the stands are generally in good condition, with mangrove recruitment occurring throughout the coastal unit.

RE 8.12.20 occurs between the mangroves and residential settlements in Zones A, B and C, as well as within the St Helens Camping Reserve in Zone D. The proximity of these ecosystems to private residences and camping areas increases the risk of weed invasion from garden escapee weeds. This trend is evident throughout the coastal unit, with many garden-plant varieties found within surrounding remnant vegetation. Proximity of residential settlements to remnant vegetation may also increase pressure on native wildlife due to predation and disturbance by domestic pets. Adequate protection of remnant vegetation within these areas is important to facilitate native wildlife movement and biodiversity corridors.

RE 8.2.6 and 8.2.1 occur north of Zone D and are listed as Of Concern in the *Vegetation Management Act 1999* (DEHP 2013b). These coastal ecosystems are naturally restricted to parallel dunes covering the foredune and are vulnerable to erosion and weed invasion. Moreover, coastal forest communities are not well adapted to fire, as per the Clarke Connors Range Fire Management Guidelines (Appendix 1). A wild fire within RE 8.2.1 and 8.2.6 would likely result in the area being overrun by grassy and woody weeds. Fire risk should be minimised through the control of weeds, particularly grassy species, and removal of green waste such as palm fronds.

Regional Ecosystems found on council-managed land are further described in Appendix 2.

Weed invasion, loss of sand due to inhibited longshore sediment renourishment and accelerated erosion due to periods of bad weather continue to threaten all REs present in the coastal unit. The condition of remnant vegetation along the foredune is considered poor in Zones C and D. Cross tenure collaboration, between council and private landholders, is essential for preserving and enhancing the remaining native vegetation.

Opportunities exist to protect and enhance the native vegetation throughout the coastal unit via weed control, revegetation and facilitation of natural regeneration. Vegetation rehabilitation will enhance the complexity of vegetation zonation, increase the environmental value of the area, improve dune stability, act as a buffer against wind, salt and extreme weather events. Additional native vegetation will also provide habitat for local fauna. In areas where the native vegetation remains largely intact, the approach to be taken will be one of assisted natural regeneration. By controlling weeds and limiting disturbance, natural recruitment of dunal species will occur. Supplementary planting may be undertaken in these areas to enhance vegetation complexity and to replace removed weed species. In areas where natural recruitment is not occurring or where vegetation has been cleared, revegetation should be used as a technique to restore and enhance native vegetation.

Succession planning of old trees will ensure that the natural and recreational values (shade etc.) of these trees are sustained. The local community is highly motivated to facilitate the growth of vegetation to protect dunes. Community education about which species are most effective in preventing erosion and native to the local Regional Ecosystems would be beneficial and encourage positive stewardship.

All revegetation activities should be guided by the coastal revegetation principles documented in Appendix 3 and consider appropriate species from the list provided in Appendix 4. The species selected for revegetation at any particular location will ultimately depend on current and pre-clearing regional ecosystem mapping and site-specific conditions such as aspect, topography, existing vegetation, soil condition and the availability of appropriate plants. Local experts should be consulted for specific advice regarding unique vegetation communities, where appropriate.

Table 1: *Regional Ecosystem (RE) communities of the St Helens Beach coastal unit.*

Regional Ecosystem (RE)	Short description (Environmental Protection Agency 2005)	Approximate area (ha) on Reserve, Esplanade, State Land tenure	Vegetation Management Act status 2005	Biodiversity status	EBPC Act status
8.1.1	Mangrove vegetation of marine clay plains and estuaries. Estuarine wetland	14.67	Not of concern	No concern at present	n/a
8.2.1	*Casuarina equisetifolia* woodland and/ or sparse herbland to open scrub on foredunes and beaches	0.12	Of concern	Of concern	n/a
8.2.6	*Corymbia tessellaris +/- Acacia leptocarpa +/- Allocasuarina littoralis +/- Banksia integrifolia +/-* rainforest species open forest on parallel dunes		Of concern	Of concern	n/a
8.12.20a	*Eucalyptus drepanophylla* and/ or *E. platyphylla +/- Corymbia spp. +/- E. crebra* woodland on low gently undulating landscapes on Mesozoic to Proterozoic igneous rocks	7.03	Least concern	No concern at present	n/a

Figure 9: *Remnant vegetation communities of the St Helens Beach coastal unit.*

4.1.2 Vegetation Zonation

A key feature of dune vegetation is the sequence of different vegetation communities that occur with increasing distance landward. Typically, this involves a gradual transition from bare sand, to ground cover, to open forests or woodlands (DEHP 2015). Zonation processes are those which facilitate this progression and are discussed in this Local Coastal Plan as recruitment and colonisation. Natural zonation refers to what is effectively a normally behaving ecosystem, where recruitment and colonisation can occur unhindered over natural gradients (Figure 10).

Vegetation zonation along the foreshore areas of St Helens Beach is largely inhibited by human activity. Along the coastal strip and particularly within Zones C and D the foredunes are largely backed by mown open space areas or backyards that flow directly into residential settlements and/or streetscapes. Mowing the open space areas at St Helens Beach Esplanade Reserve and St Helens Camping Reserve interrupts natural vegetation zonation by impeding recruitment and growth of juvenile trees. Regeneration of juvenile Moreton Bay ash (*Corymbia tesselaris*) and other native species are evident throughout Repulse Esplanade Reserve (Figure 11). Succession planning is required in the St Helens Beach Esplanade Reserve and Camping Reserve. A good balance between public recreational use and maintaining the environmental values of this area needs to be maintained into the future as it would foster natural tree regeneration to improve vegetative cover, widen the coastal corridor and reduce maintenance costs. Any tree or vegetation planting activities should be planned and implemented in partnership and agreement with the community. In Areas C and D, vegetation zonation is adjacent to open mown areas with recreational facilities. This coastal strip has mature vegetation with natural recruitment occurring on the lower and sloping terrain. Moreton Bay ash and other native species are recruiting throughout Repulse Esplanade Reserve (Figure 11). The southern section of St Helens Beach (along Wootaroo Esplanade) is extremely exposed and becomes heavily eroded during periods of extreme weather. The geometry and topography of the beach front along this section of coast impedes the build-up of sand and the formation of dunes along this section.

Erosion is also impacting vegetation zonation at St Helens Beach. Dune replenishment has been diminished by the loss of coastal vegetation and development of the coastal unit. Erosion undermines vegetation, exposing roots and eventually results in the loss of vegetation (Figure 12). Loss of coastal

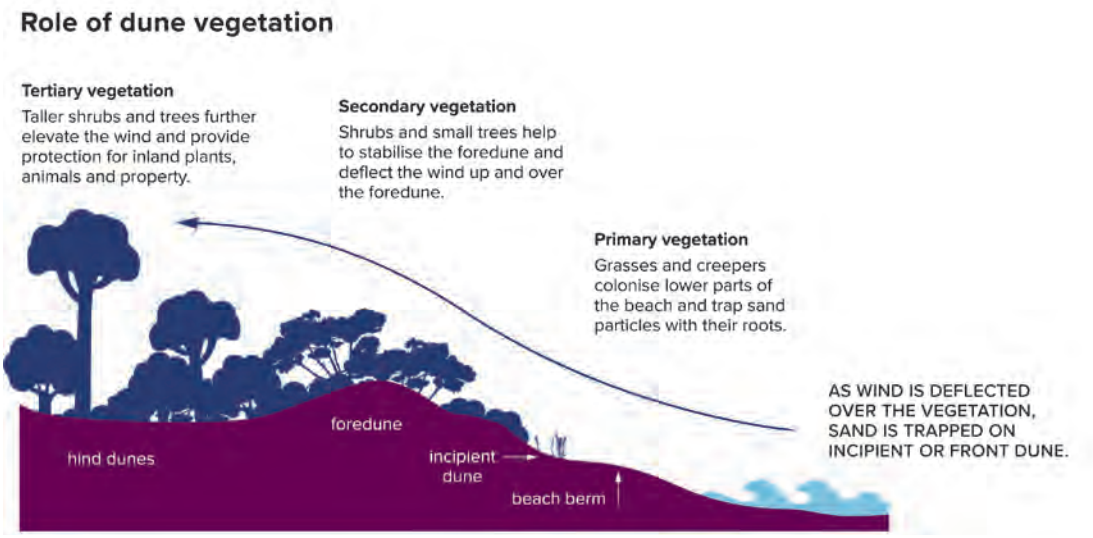


Figure 10: *Role of dune vegetation.*

Figure 11: *Moreton Bay ash (Corymbia tessellaris) recruiting through St Helens Beach Esplanade Reserve.*

Figure 12: *Erosion at St Helens beach undermining roots of dune vegetation.*

vegetation due to erosion is exacerbated by inappropriate beach access. Pedestrian traffic destabilises sand and removes native vegetation, opening the area up to further erosion. Vegetation along Zones C and D is impacted by the above inhibitive processes, reducing the vegetation communities' ability to regenerate. The result is a thin band of highly altered vegetation in front of Wootaroo Esplanade. Natural zonation processes could be improved in these Zones by revegetating the coastal strip with natives. The establishment of goat's foot (*Ipomoea pes-caprae*) and coastal she-oaks should be encouraged through selective weed control and improved access management to assist natural colonisation and dune stabilisation.

Vegetation zonation processes are operating more naturally between areas of residential settlement owing to fewer disturbances to the vegetation and connectivity with Skull Knob Conservation Park. This is protected from prevailing southeast winds by Skull Knob, potentially reducing the erosion in this section. Vegetation corridors between the coastal vegetation strip and the larger remnant vegetation area within Skull Knob Conservation Park, increase the resilience of the coastal vegetation communities and facilitate movement of native species through the landscape. Edge effects, such as colonisation of garden escapees, are also increased due to residential settlement.

Another impediment to zonation processes is remnants of erosion control on the foredunes throughout Zone D, preventing vegetation from growing (Figure 14). Compounding the problem, rock walls and sleeper-rail walls erected by residents to protect private properties may be exacerbating erosion by expediting erosive scour processes. Removal of this past erosion control material is recommended in conjunction with revegetation to protect exposed sand. It is recommended that an updated SEMP be compiled for the area, before any action is taken to remove the various past efforts to control erosion. It is important to consider the impact that removing these structures may have on destabilising the dune. Any work will need to be undertaken in conjunction with community consultation and will require the agreement of the community. In response to discussions with the Beach Protection Authority, a series of rock and railway sleeper walls were installed by residents in Zone C and D to protect private property (St Helens residents 2020, pers. comm.). Removal of this material is recommended in conjunction with revegetation to protect exposed sand, and should be planned and designed in consultation with community residents.

Erosion, loss of native vegetation, weed incursion and waste dumping actions interact in complex ways, generating negative feedback loops which can result in the continual disruption of zonation processes. These processes could be improved throughout the coastal unit by revegetating the coastal strip and the crest of the foredune with natives. The exposed nature of much of the southern section of St Helens Beach (Wootaroo Esplanade) combined with south-east prevailing winds limits the build-up of sand along the escarpment. Increasing the area of natural coastal vegetation along the foreshore should be encouraged to allow for migration and increased dune stability.

Weed control and rehabilitation activities should be included to improve the dune structure and the condition along the length of the beach. Revegetating the dune system in this way will also enhance connectivity of vegetation, increase the aesthetic value of the area, provide shade and provide privacy for residences neighbouring publicly reserved areas. Weed control and infill planting would also assist vegetation establishment, and in doing so restore natural zonation, reduce wind speeds, increase natural shade and provide habitat for local fauna.

Figure 13: *Mown State land in Zone B of coastal unit.*

Figure 14: *Large tractor tyres, rocks and other items preventing regeneration of coastal vegetation.*

4.1.3 Non-native vegetation

The presence of non-native vegetation can be detrimental to the function of the dunal environment. Non-native vegetation can displace native dunal vegetation due to its ability to grow aggressively, smother native dunal species and compete for available nutrients. Transformative weeds such as Guinea grass and lantana can also increase fuel loading and fire intensity.

It is important to note that while not all weeds require immediate removal due to low impacts on native species, under the *Biosecurity Act 2014* (DAFF 2014), council and the local community have a general biosecurity obligation to take reasonable and practicable steps to minimise the risks associated with invasive plants and animals under their control. This legislation was put into force on the 1st July 2016 and changes the classifications of weed species from what has been referred to in earlier Beach Plans. Subsequently, weeds will now be discussed in terms of:

- **Declared weeds** are described as species that have, or could have, serious economic, environmental or social impacts (DAFF 2013). Declared weeds recorded at St Helens Beach such as lantana and Singapore daisy (*Sphagneticola trilobata*) require action for removal under the *Land Protection (Pest and Stock Route Management) Act 2002* (Queensland Government 2006).
- **Environmental weeds** are described as those that can cause major modifications to natural ecosystem function. These species are capable of outcompeting native vegetation and in some cases, have the potential to increase fuel loads in coastal ecosystems largely sensitive to fire (DAFF 2013). Environmental weeds for removal at St Helens Beach include but are not limited to common sensitive weed (*Mimosa pudica*), Guinea grass, leucaena (*Leucaena leucocephala*) and Seaforth burr (*Cenchrus echinatus*).
- **Locally significant weeds** are those that impact natural processes at a local scale. Locally significant weeds within St Helens Beach include painted spurge (*Euphorbia cyathophora*) and Cobbler's peg (*Bidens pilosa*).
- **Non-transformative/nuisance weeds** are problematic on a local scale and should be managed on a case-by-case basis. A multitude of herbaceous weeds and garden escapees result from the close proximity of coastal Reserves to residential settlements and include, century plant (*Agave* sp), pink periwinkle (*Catharanthus roseus*), poinciana (*Delonix regia*), siratro (*Macroptilium atropurpureum*) and mother-in-law's tongue (*Sanseviera trifasciata*).

There are two weeds species that should be treated as a high priority for weed management in the St Helens Beach coastal unit: Guinea grass and Singapore daisy. Guinea grass has established in disturbed dunal vegetation where the canopy is sparse/open enough to allow sufficient sunlight (Figure 15). It occurs along the edges of vegetation throughout Zones A, B, and C, and is densely established throughout the dunal vegetation near St Helens Camping Reserve in Zone D. The invasion of weedy grasses, such as Guinea grass, increases fuel load and fire risk. In many coastal vegetation communities, such as RE 8.2.6, even low intensity burns can negatively impact the dominant species. Furthermore, because many grasses re-establish quickly and extensively after fire, they are capable of fundamentally transforming the composition of the vegetation present. Singapore daisy is present within Zones B and C in isolated, healthy patches particularly around drainage lines (Figure 16). Singapore daisy is a Weed of National Significance (WONS) and a Class 3 declared weed (DAFF 2013). The groundcover can spread rapidly, out-competing and excluding natives from an area. Council is willing to work in collaboration with adjacent land holders to ensure a targeted and strategic weed management approach.

Figure 15: *Guinea grass (Megathyrsus maximus) established in St Helens Beach foredune vegetation.*

It is recognised that the locals at St Helens Beach are making efforts to revegetate degraded areas of the coastal strip. “Anne’s Walk” (Figure 17) presents a well-used local walking trail that has benefited from the individual revegetation efforts of residents. Whilst the majority of introduced plants are native, some however are not. Cultivation of non-natives, particularly garden escapee weeds, within small garden beds at the base of mature trees is occurring throughout St Helens Beach Esplanade Reserve (Figure 18). Garden escapee weeds pose a risk to the remnant vegetation with many known to readily invade foreshore vegetation if not controlled. Problematic garden escapees identified throughout the coastal zone include mother-in-law’s tongue, painted spurge and pink periwinkle. These species should be a high priority for removal from St Helens Beach Esplanade Reserve. Other common garden species identified throughout the park include bromeliads (*Bromeliaceae*), golden trumpet (*Alamanda cathartica*), spider lily (*Hymenocallis sp.*), *Agave* sp. and frangipani (*Plumeria sp.*). These species should be a high priority for removal, in consultation with the community from St Helens Beach Esplanade Reserve.

Coconut palms (*Cocos nucifera*) are also established throughout the coastal zone. These palms are a source of green waste (fronds) throughout the local coastal plan area. Council recognises that some community members may value coconuts for their aesthetic appeal. The removal of adult coconuts from recreational and open space areas is beyond the scope of this plan. However, juvenile coconuts that occur within areas managed for environmental purposes will be removed in accordance with the coastal weed control principles (Appendix 5). Coconut trees may assist in foredune stability; however their root system is very shallow and is easily undermined by high waves as shown in Figure 19. Alternatively, the root zones and suckering nature of coastal she-oak (*Casuarina equisetifolia*) have been shown to stabilise sand dunes and their form and habit arrests wind-blown sand.

Non-native vegetation is also likely to have established in the area due to vehicle access. Inappropriate vehicle access points to the beach may be facilitating the establishment of weeds on the foredune area by disturbing soils and native vegetation, exposing the sites to weed incursion and transporting seeds from place to place in vehicle tyres. Proposed designated beach access tracks should assist in reducing the spread of weeds across the frontal dune.

It is recommended that weed management continues throughout the coastal unit and this, together with revegetation activities to replace removed weed species, will prevent future weed reoccurrence and assist the re-establishment of native vegetation. Opportunities for local community members to get involved in coastal management activities will be provided through the Coastcare program. All revegetation activities should consider the guiding principles documented in Appendix 3.

The removal of non-native species from the coastal unit will improve the condition of native vegetation, enhancing habitat quality and its resilience to natural disturbance whilst also reducing the risk of fire. Using appropriate weed control techniques in a progressive manner as time and resources permit, as per Appendix 5, will assist the rehabilitation of coastal vegetation communities. A list of weed species common to the Mackay region can be found in Appendix 6.

Figure 16: *Singapore daisy (Sphagneticola trilobata) established along drainage lines at St Helens Beach.*

Figure 17: *Anne's walk.*

Figure 18: *Garden escapee weeds established in St Helens Beach Esplanade Reserve.*

Figure 19: *Coconut palms doing little to stabilise dune sediment from erosion. It is evident from these pictures taken at McEwens Beach that the confined root-ball is stabilising only a very limited area of dune. More extensive and far-reaching root systems, such as those from coastal she-oaks, would stabilise a larger area of dune.*

4.2 WILDLIFE

All sandy beaches in the Mackay region provide potential habitat for marine turtle nesting and turtles are commonly sighted within the waters of St Helens Bay. The use of St Helens Beach by female marine turtles for nesting is unknown, due to the lack of a long-term monitoring program, however local residents suggest that turtles do not nest on this stretch of beach. Significant challenges are present for turtle nesting along the foreshore including a receding shoreline, rocks under the sand, residential lights, noise pollution from the road and the presence of large rocks, concrete, tyres and other items covering the foredune, making the area unconducive to turtle nesting.

Green turtles (*Chelonia mydas*) and flatback turtles (*Natator depressus*) are listed as vulnerable in State (*Nature Conservation Act 1992*) and Federal (*Environment Protection and Biodiversity Conservation (EPBC) Act 1999*) legislation. Given their status, a *Recovery Plan for Marine Turtles in Australia* has been in place since 2003 (DEE 2017) and provides an overview of threats and recovery actions required for these species. Key threats to turtles and their reproductive success are identified as the following:

- Light and noise pollution from nearby houses disorientates hatchlings during their movement to the ocean.
- The presence of foxes (*Vulpes vulpes*), feral pigs (*Sus scrofa*), dogs and other domestic pets in the area, particularly those not on leashes, pose a number of threats including mortality of hatchlings from predation, exposing of clutches from digging and injury to turtles while laying eggs.
- Distribution and type of vegetation (i.e. root system), including excessive shading or lack thereof plays an influential role determining the sex of the hatchling.
- Unofficial tracks through the dune system, where tracks appear brighter than surrounding areas due to light reflection and can disorientate both hatchlings and adults.
- Beach vehicle access, as turtles are not able to penetrate the compacted sand or navigate wheel ruts.

While St Helens Beach is not monitored for turtle nesting sites, the sandy sections constitute good conditions for nests, and it is possible that nests could be found upon further investigation. The bay at the northern end of the coastal unit contains seagrass and supports populations of turtles and dugong. Further, St Helens Bay, which extends north past Cave Reef and south over North Red Cliff Island (Figure 20), is listed in the Directory of Important Wetlands in Australia (DEE 2019). St Helens Bay provides a range of habitats for marine species, including deep water, coral reef, rocky shore, sandy beach, shallow water intertidal mud and sand flats, mangrove communities and minor areas of saline clay plain and supratidal flats, which in turn support a wide variety of biodiversity. The wildlife values of the marine environment are communicated well via signage. There are three signs at the top of the boat ramp in the car park area outlining the significance of St Helens Beach as dugong habitat, details about the net-free-zone and associated voluntary code of conduct for recreational fishers, and the importance of seagrass. It is recommended that the dugong signage is updated to include appropriate boat speeds and safety measures.

Essential Habitat mapping identifies sites and locations considered to contain important habitat for flora and fauna species of conservation significance. It is only mapped over either remnant or regrowth vegetation and is based on either confirmed sightings, records of breeding, known suitable habitat or resources occurring at a location, or habitat that forms part of a potentially important corridor (DEHP 2014). Essential Habitat for the mangrove mouse (*Xeromys myoides*), which is listed as Vulnerable under the Queensland Government's *Nature Conservation Act 1992*, includes the

vegetation strip running along the foreshore in front of St Helens Beach Esplanade Reserve south into State land (Figure 21). This species is a small native rodent recorded from coastal saltmarsh, samphire shrublands, saline reed beds and grasslands, mangroves and coastal freshwater wetlands. Other names for this species include the false water rat and yirrkoo. Mature animals appear to utilise taller communities dominated by yellow mangrove (Ceriops tagal) and orange mangrove (*Bruguiera spp.*), however juveniles are sometimes located in low forests of yellow mangrove. The quantity and quality of storm water entering the catchment will be of relevance to the health of the mangrove mouse population. The mangroves themselves provide habitat for fish and turtles as well as larger vertebrates such as crocodiles (*Crocodylus porosus*). Mangroves are particularly important to Northern Queensland because they provide habitat for juvenile coral reef fish which are important to the economy and serve as intermediate nurseries which increases the survivorship of many species of these young fish (Mumby *et al.* 2004).

The coastal unit also contains Essential Habitat for the coastal sheathtail bat (*Taphozous australis*) (Hourigan 2011). These bats are known to live in highly specialised habitats such as beach scrub, mangroves, *Melaleuca* swamps and coastal heathlands. Any threat to these vegetation communities constitutes a threat to the coastal bat, which is classed as Near Threatened under the *Nature Conservation Act 1992*. Coastal sheathtail bats are suspected to be easily disturbed when at roost and could be negatively impacted by noise. There is currently no widespread decline documented for the species, however disturbance due to high rates of human visitation at roost sites can have negative impacts on the species and may cause low breeding success or roosts to be abandoned. Coastal sheathtail bats are believed to forage within a short distance of the coast. This species is distributed in a thin band along the north-east Queensland coast from Shoalwater Bay to Cape York Peninsula. Its distribution throughout its range is believed to be uneven, due to its reliance on suitable coastal roost sites. The loss of foraging habitat as a consequence of coastal development, combined with roost disturbance (with increasing human access to the coast) may pose a threat to this species.

The length of the coastal unit, excluding Carpet Snake Island and Zone A, is also mapped as a shorebird roosting area. St Helens Beach is listed as a significant roosting site in *Mackay Shorebird Plan: Final report* (Harding and Milton 2003). The roost is one of four sites within the Mackay region that are most highly impacted by human disturbances, notably including disturbance by people (e.g. walking), dogs, vehicles, boats and jet skis although the relative influence of each individual disturbance is expected to vary between sites. Roosting shorebirds can provide recreational value by viewing from a distance, without the risk of disturbance. The shorebirds are easily viewed at high tide from the beach, with high numbers of the distinctive pied oystercatcher (*Haematopus longirostris*). Providing appropriate access to the foreshores is crucial to ensure that the main shorebird roosting areas are not disturbed. Controlled beach access can be provided by appropriate signposting of beach access points. The pied oystercatchers and other resident shorebirds are likely to nest along the nearby foreshores.

Pest species, including foxes, feral cats and feral pigs have been recently recorded at St Helens Beach (Figure 22 and 23). Foxes are known predators of the native mangrove mouse, and also pose a threat to the coastal sheathtail bat, resident and migratory shorebirds, turtle hatchlings and a range of other species. Feral cats indiscriminately hunt native wildlife. They have been implicated to have caused the extinction of several native ground-dwelling birds and small to medium-sized mammals. Feral cats are known to carry diseases which are readily transmitted to and affect domestic animals and humans such as toxoplasmosis. Feral pigs also negatively affect native wildlife by spreading weeds, degrading soil and water and carrying ticks and disease. It is recommended that pests are controlled throughout the coastal unit to protect native wildlife.

Fishing is a major component of the St Helens Beach lifestyle. Since 1 November 2015, a net-free fishing zone, extending from St Helens Beach to Cape Hillsborough, has been in place. This net-free zone excludes commercial fishing boats from netting in the area, thereby increasing the abundance of important recreational and economical fish species (Infofish Australia 2018). This zone was established with the intent of improving recreational fishing opportunities. The Mackay Recreational Fishers Alliance surveyed recreational fishers from 2015-2018, and the data shows that the average time taken to catch a fish has decreased since the establishment of the Net Free Zone and average catch rates increased, indicating that fish populations are recovering. Additionally, the area will constitute improved habitat for dugongs, dolphins and turtles which are frequently caught as by-catch in commercial nets, complementing the efficacy of the Species Conservation (Dugong protection) Special Management Area within the Great Barrier Reef Marine Park.

Currently, the major threats to wildlife along the coastal unit include loss of habitat through development, erosion, weed incursion, infrastructure, feral and domestic animals. Opportunities exist to protect native wildlife by improving habitat through weed control and assisted regeneration of coastal vegetation, and promoting minimal disturbance through improved community awareness, especially during roosting season for migratory shorebirds, and pest control targeting foxes and feral pigs. Additionally, interpretive signage may be installed, featuring key faunal species and ecosystems (such as migratory shorebirds) at high profile locations within the coastal unit, such as St Helens Beach Esplanade Reserve and St Helens Camping Reserve. Signage informs the general public about what they can do to protect significant species

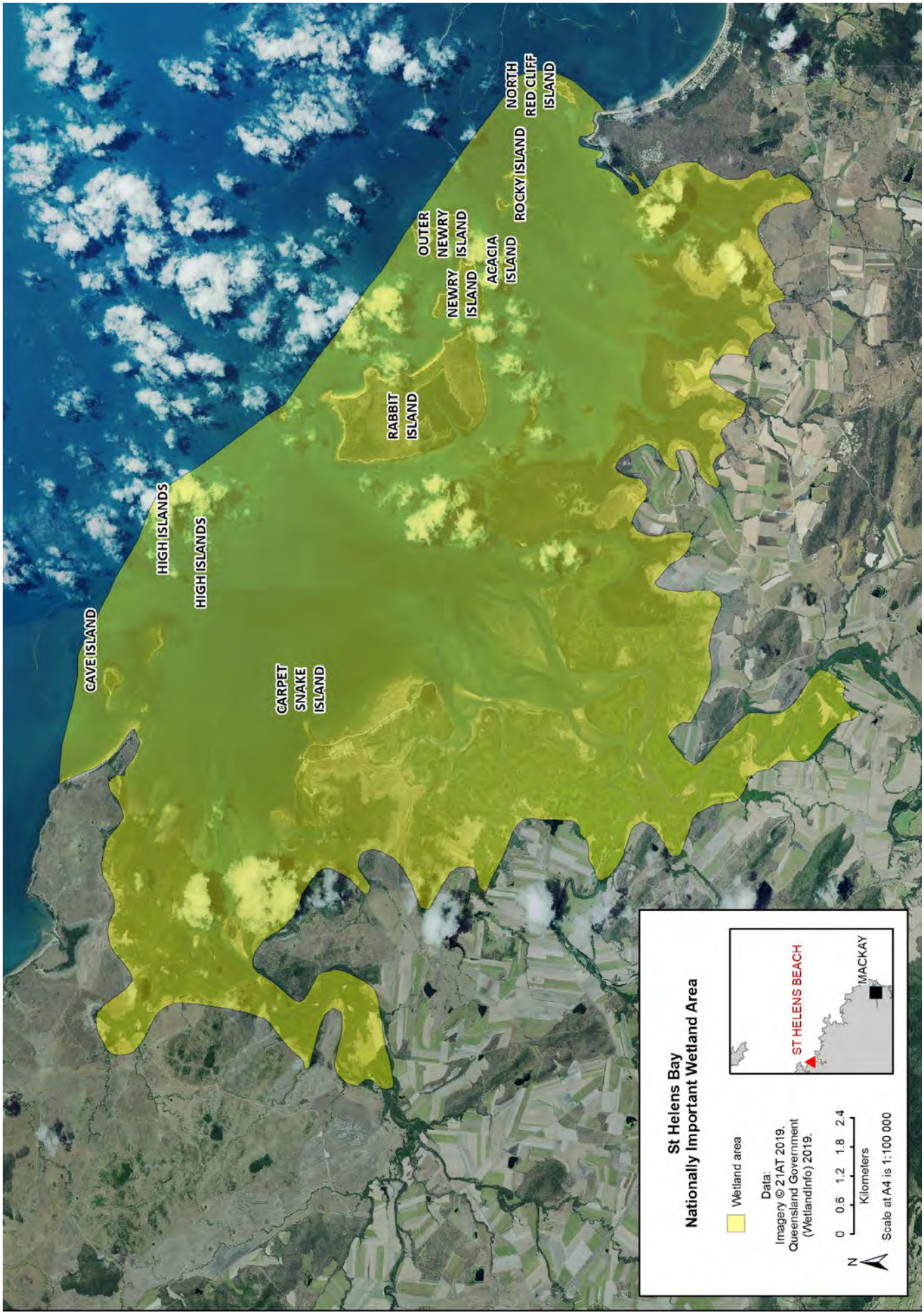


Figure 20: *St Helens Bay Nationally Important Wetland area.*

Figure 21: *St Helens Beach wildlife values.*

Figure 22: *Red fox (Vulpes vulpes) captured on camera at St Helens Beach by Pioneer Catchment Landcare.*

Figure 23: *Feral pig (Sus scrofa) captured on camera at St Helens Beach by Pioneer Catchment Landcare.*

and ecosystems. Holding community days to remove marine debris from the beach will further enhance the habitat values of the beach.

4.3 EROSION

4.3.1 Coastal processes and erosion

St Helens Beach foreshore and a large portion of the broader Mackay region's beaches maintain sand dunes in the coastal unit. Coastal dune systems play a crucial role in facilitating coastal ecosystem processes and in the protection of property in the coastal unit (DERM 2011a). As part of the broader sand movement process, healthy dune systems act to dissipate the kinetic energy of waves, which may otherwise propel into adjacent infrastructure and property. The sand and dunes create friction when waves pass over them, slowing the waves down and dissipating their energy. Healthy coastal dunes help protect coastal infrastructure during intense wind, storm and cyclone events (Figure 24). The dunes also act to replenish the foreshore with sand after major sand-loss events.

However, human-induced changes have altered coastal areas and therefore dune formation. For example, the loss of coastal vegetation for open space and coastal development reduces the capacity of beaches to catch and trap wind-borne (aeolian) sand grains. Once the protective capacity of the dune system is weakened in this way, coastal erosion can take place, leading to significant damage to landforms and infrastructure via coastal recession.

Planners and coastal residents may have a negative association with erosion and coastal recession, though in many cases it is a natural phenomenon. There are constant interactions between coastal landforms and the ocean, and this creates a dynamic and ever-changing environment. Sandy coastlines migrate landward and seaward in response to natural phases of sand erosion (loss) and accretion (gain). Sand movements can form dunes onshore, sand bars offshore, or instigate beach erosion. All of these movements are governed by wind, waves and tidal activity over varying time scales.

Over short time scales there are natural beach fluctuations in response to intense weather activity. For example, during a storm, strong waves carve away sand from the beach and dunes, resulting in escarpments onshore and sand bars offshore. Gradually, sometimes over many years, the sand that was lost offshore is pushed back onshore by gentler high tides (Figure 24). This process is natural and, in many cases, cannot be stopped.

However, long term erosion or accretion is driven by fundamental changes in the dynamics of sand deposition and removal from a beach system. This is an on-going problem and preventing beach recession would often require continual nourishing. This is illustrated in Figure 24, where too much sand from coastal dunes is lost seaward to allow the dune to be restored to its original state.

Challenges to dune health are often unavoidable in developed areas. However, intervention and management can help to protect the coastal landforms.

Dunes should be protected where possible by maintaining and enhancing native vegetation. Ground cover, shrub and tree species stabilise dunes with their root systems and catch wind-borne sand sediments to replenish the dunes and foreshore. The loss of this vegetation can lead to accelerated rates of erosion of the dunes. The natural build-up of sand in frontal dunes needs to be encouraged as a reservoir for sand during periods of wind and wave erosion. Plant communities provide vegetative cover, which stabilises the dune and thus make the system resilient to pressures such as sea level rise, storms, and floods. Supporting vegetation as a surface cover increases dune stability but also biodiversity and ecological function of the dune system (DEHP 2013a). Coastal vegetation is also important in protecting infrastructure and houses, as it slows wind speeds and reduces the amount of salt and sand transported inland.

Damage to dunal vegetation in the Mackay region often occurs through pedestrian and vehicle traffic, and acts of vandalism. Intentional removal of coastal dune vegetation, as well as inappropriate pedestrian and vehicle access, displaces sand, and where it continuously occurs, can lead to localised eroded areas. Clearly established pathways to the foreshore can help to mitigate the threat of people and vehicles destroying dunal vegetation by funneling activity to a small number of well-maintained pathways. To prevent the degradation of dune systems and for public safety, it is important for users to stay on designated tracks. A range of consultation and education opportunities should be provided to the local community to mitigate damage to dunal vegetation.

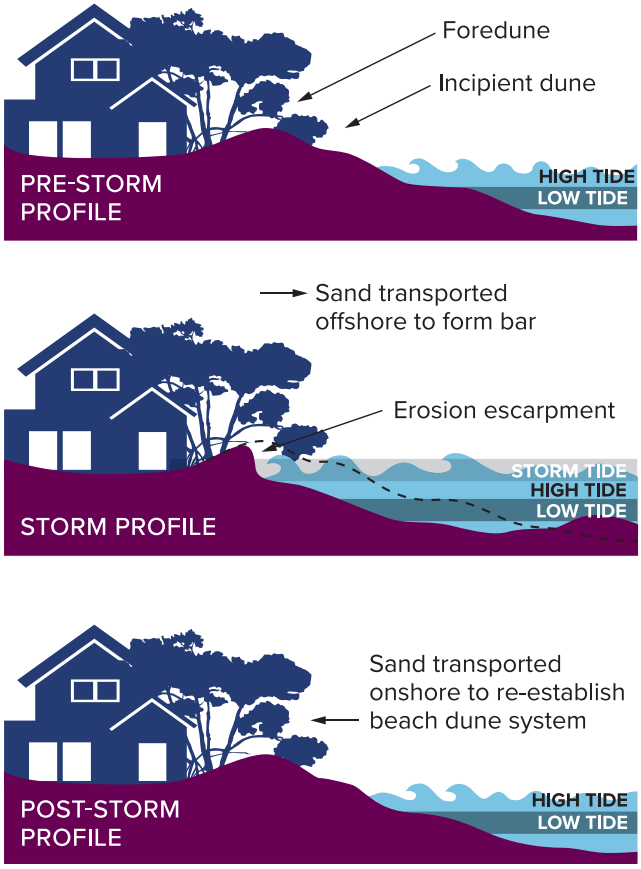
Another major threat to the natural function of dunes is hard infrastructure (e.g. seawalls). Often these structures are built in the attempt to protect property from shoreline recession. Seawalls and other hard structures reflect wave energy onto other areas, rather than gradually dissipate the energy like dunes do. This leads to scouring around the edges and in front of seawalls and accelerates the loss of sand on the surrounding beach.

Ensuring that erosion prone areas (Figure 25) remain free of hard infrastructure and well covered by native vegetation allows natural processes to occur unhindered. This provides the best opportunity for managing shoreline erosion and retaining environmental values (EPA 2004). Where infrastructure is installed, such as seawalls, the amount of sand that is lost seaward is much greater than the natural amount, thereby accelerating erosion and beach recession.

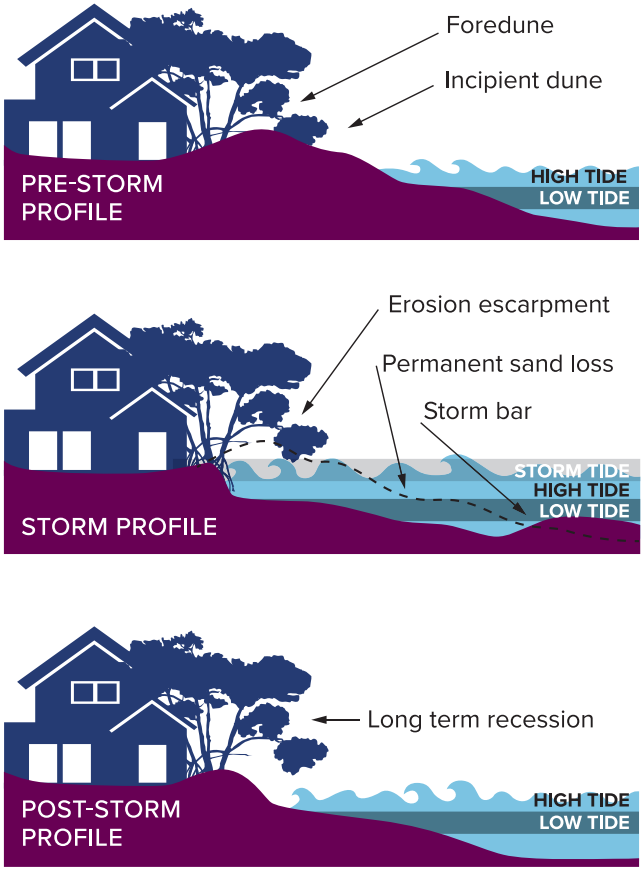
Council's policy for managing coastal erosion is outlined in their *Coastal Erosion Protection Works – Contribution and Costs Recovery Policy* (MRC 2018a). The purpose of this policy is to guide when it may be appropriate for council to deliver coastal erosion protection works, and how the costs will be shared in such situations.

The sandy beach of St Helens Beach foreshore has in the past shown a degree of shoreline erosion. In 2006 WBM completed a Shoreline Erosion Management Plan (SEMP) for St Helens Beach (WBM 2006), which includes a summary of geomorphic context, shoreline change and active processes up to 2006, as well as recommendations for future management along the St Helens Beach coastline.

The following sections (4.3.2 to 4.3.6) describe the geomorphology and processes shaping the St Helens Beach



Beach erosion/accretion cycle showing no permanent sand loss or coastline retreat *(Source: DERM)*.



Long term beach recession showing profile displaced landward due to permanent sand loss *(Source: DERM)*.

Figure 24: *Beach erosion processes.*

Figure 25: *Erosion prone areas of St Helens Beach.*

coastal area, the threats and management considerations, as identified in the geomorphic review of the St Helens coastal unit undertaken by Alluvium in 2019 (Alluvium, 2019).

4.3.2 Landscape context

St Helens Beach is situated around 50km north-west of Mackay, within St Helens Bay (Figure 26). St Helens Bay is a dynamic zone characterised by extensive tidal flats and influenced by inflows from the St Helens, Murray, Sandfly, Jane, and Blackrock Creek systems, as well as coastal processes (wind, wave and sediment dynamics). The Bay is bounded by the Stewart Peninsula (Dewars Point) to the north and the Newry Islands (including Rabbit Island) to the south. Offshore islands and reefs provide some protection to the coastline, reducing exposure to wave action.

The St Helens Beach shoreline has developed as an infilled coastal plain between rocky headlands, and with an extensive barrier spit across the Sandfly Creek system to the south. Over landscape evolution timeframes (several thousand years), longshore sediment accumulated in the lee of Carpet Snake Point has developed a sandy barrier spit across the entrance of Sandfly Creek (Figure 26, Figure 27 and Figure 28).

The St Helens Beach coastline includes three settlement areas (Figure 27). The northern settlement along Stockers Road (with around seven residences) is located near the boat ramp. The main settlement (around 95 properties) is situated south of Carpet Snake Point. These settlements are both situated along the sandy pocket beaches that have accumulated between the headlands.

The southern settlement along the old Wootaroo Esplanade is developed along the sandy barrier spit, a dynamic part of the landscape (Figure 27 and Figure 28). Now serviced by Murray Road, this settlement includes 24 residences.

The broader St Helens Beach coastal zone is well vegetated, and extensive mangrove ecosystems are present along the coastline and creek networks.

4.3.3 Sediment transport pathways

Regional off-shore sediment transport direction is to the north, however turns to the south in the lee of the Stewart Peninsula headland and Carpet Snake Point (Figure 26 and 27). Key features of sediment supply and distribution include the following:

- The main sediment transport pathway along St Helens Beach is to the south, as observed in the accumulation of sediment on the northern side of existing groynes at the Murray Road shoreline (Figure 26 and Figure 27).
- Complex interactions of creek inflows, waves and tides in this part of St Helens Bay will also influence local variations in longitudinal and cross-shore sediment transport along St Helens Beach.
- The broader coastline along St Helens Beach generally comprises of a wide (approximately 700m) intertidal flat and low-gradient sandy beaches. Underlying rock is

Figure 26: *St Helens Beach indicative sediment transport and distribution pathways.*

Figure 27: *The three St Helens Beach settlements and beaches.*

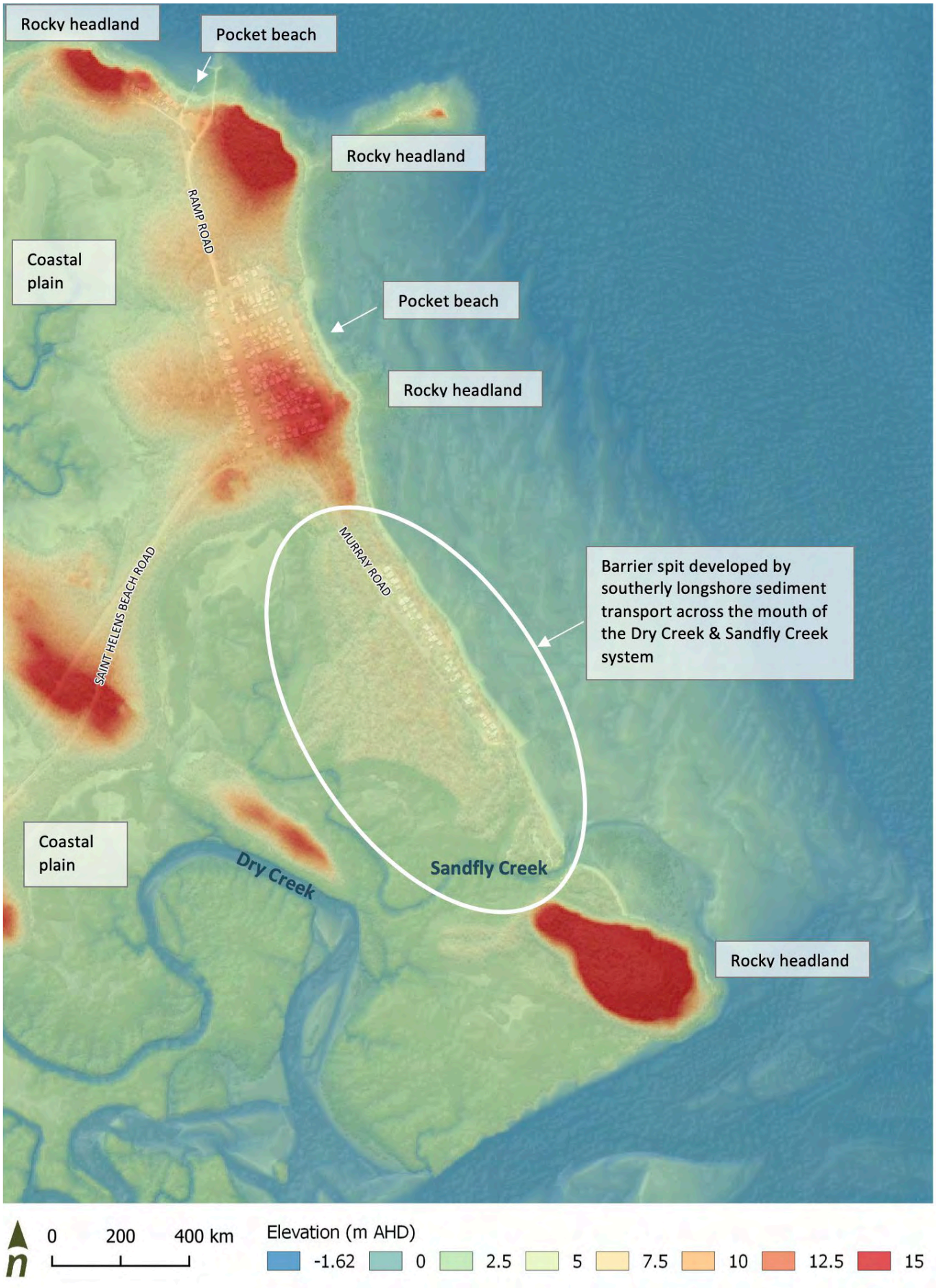


Figure 28: *St Helens Beach elevation and landscape features (LiDAR) data (m AHD) – refer to Figure 25 and Figure 26 for location information.*

exposed at several locations.

- Cross-shore sediment transport is via a network of sandy shoals.

4.3.4 Sediment supply and trajectory

The main historical sediment sources to the St Helens Beach shoreline include supply from longshore sediment transport from the north, as well as sediment delivered from adjacent river systems, in particular the Sandfly and Dry Creek system. The long term trajectory of sediment supply generated by past catchment clearing is likely to be diminishing.

4.3.5 Shoreline changes

Parts of the St Helens Beach shoreline has changed considerably over recent decades. Comparative shoreline changes from 1953 to 2016 indicate (Figure 29):

- Minor adjustments along the main settlement beach
- Major changes along the southern shoreline
- Changes in the depositional zones and offshore-environment at the mouth of Sandfly Creek and Dry Creek, and around the Skull Knob headland.

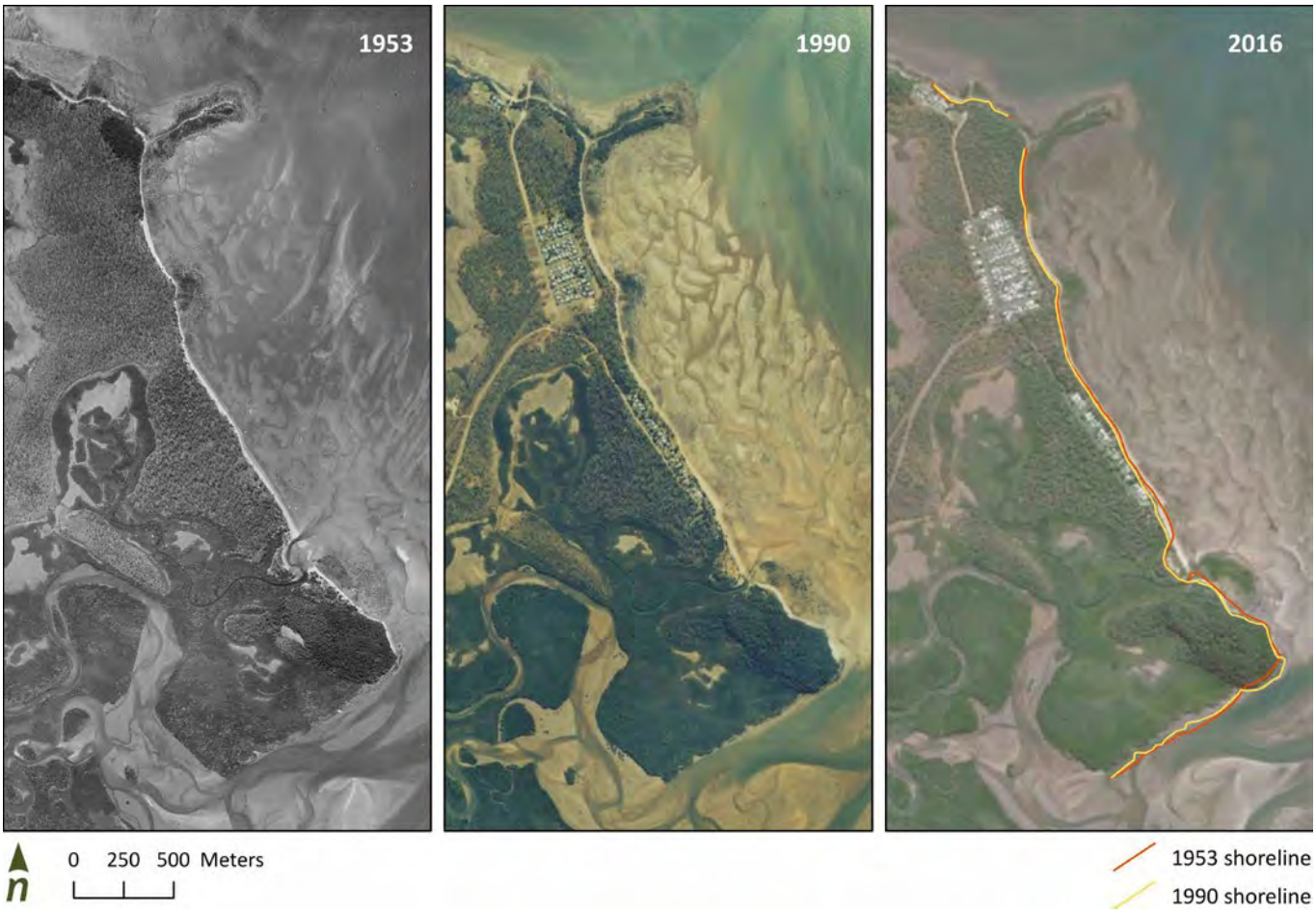


Figure 29: *Historical shoreline movement (1953 – 2016). Indicative profiles digitised from georeferenced historic aerial imagery.*

These observations were supported by site observations and the experiences of the St Helens community (shared and collated in June 2019).

Northern beach

The northern beach near the boat ramp is a small pocket beach situated between two headlands. The backshore environment is at relatively higher elevation, where the residences are established. The beach itself has a low gradient intertidal zone with mixed rocky, gravel and sand sediments (Figure 30), with mangroves well established in the near shore environment. These mangrove communities provide protection to the shoreline from wave energy.

No major changes in shoreline position is observable from past imagery (Figure 29). Sand supply to this section of the coast is relatively low. The sheltered nature of the pocket beach means it is prone to fine sediment accumulation in the near-shore and off-shore areas.

The boat ramp situated at this location is the main launching point for the region. The original ramp was constructed in 1962 and upgraded in 2017. Stockers Road was constructed around 1980, with residential properties developed soon after. The boat ramp orientation creates a sheltered still water area behind the breakwater structure which creates an environment prone to the deposition of fine silts (Figure 31).

Main St Helens Beach

Figure 30: *Looking west along the northern beach and established mangroves along the near-shore.*

Figure 31: *Looking south west from the boat ramp towards the beach and Stockers Road residences.*

The main St Helens Beach is a larger pocket beach bounded by Carpet Snake Point to the north, and a small headland to the south. Historical shoreline changes (Figure 32) indicate that the overall shoreline has been relatively stable in this area over the last 70 years, within a naturally dynamic 20–30m zone. The exception to this is the far northern end of the beach where some localised erosion has been observed over the last 20 years (Figure 28 and WBM 2006), however the beach is demonstrating the ability to rebuild and recover. The substantial elevated backshore area currently provides a buffer between the coast and the road/residential zone. Mangrove growth in the offshore area provides some protection to the shore from wave action, however is limited in extent (Figure 33 and Figure 34).

The beach form consists of a relatively steep (high energy) intertidal zone, and lower gradient upper sandy beach, dominated by coarse sands (Figure 33). Direct/unrestricted access across the foredune area for the length of the main beach is inhibiting natural dune building process, and

Figure 32: *Historic shorelines interpreted from aerial imagery 1953 - 2016.*

Figure 33: *St Helens main beach looking south, with offshore mangrove growth.*

Figure 34: *St Helens main beach looking north along elevated backshore area.*

vegetated dunes are largely absent (Figure 34).

The cleared foreshore areas may be prone to erosion during large storm events. Enhancing understory vegetation in the foreshore area, and minimising disturbance to/rehabilitating the dune system, will be important to minimise future erosion risk.

Southern beach

The southern beach extends along the open sandy embayment developed as a barrier spit system across Sandfly Creek. Barrier spit systems are dynamic parts of the coastal landscape that can be susceptible to rapid changes and alternate periods of erosion/accretion, driven by fluvial (river) and coastal processes.

Shoreline comparisons of this section of the coast indicate major changes from 1953 to present day (Figure 35). The shoreline experienced periodic shoreline erosion and recession up until the 1990s (Figure 35). This includes substantial shoreline recession between 1953 and 1990, with in the order of 40m+ of foreshore width eroded at the southern end of the esplanade over this time. The Esplanade itself was lost due to erosion in the early 1980s and the residences are now serviced by Murray Road. Since 1990, some recovery of the beach width has occurred, associated with the presence of the rock groyne structures (Figure 35). However, the beach and foreshore remain susceptible to erosion during major storm events.

Historical photos from 1976 (Figure 36 and Figure 37) show an extensive erosion scarp, around 2m high in front of the then newly-established properties along the esplanade. A ladder

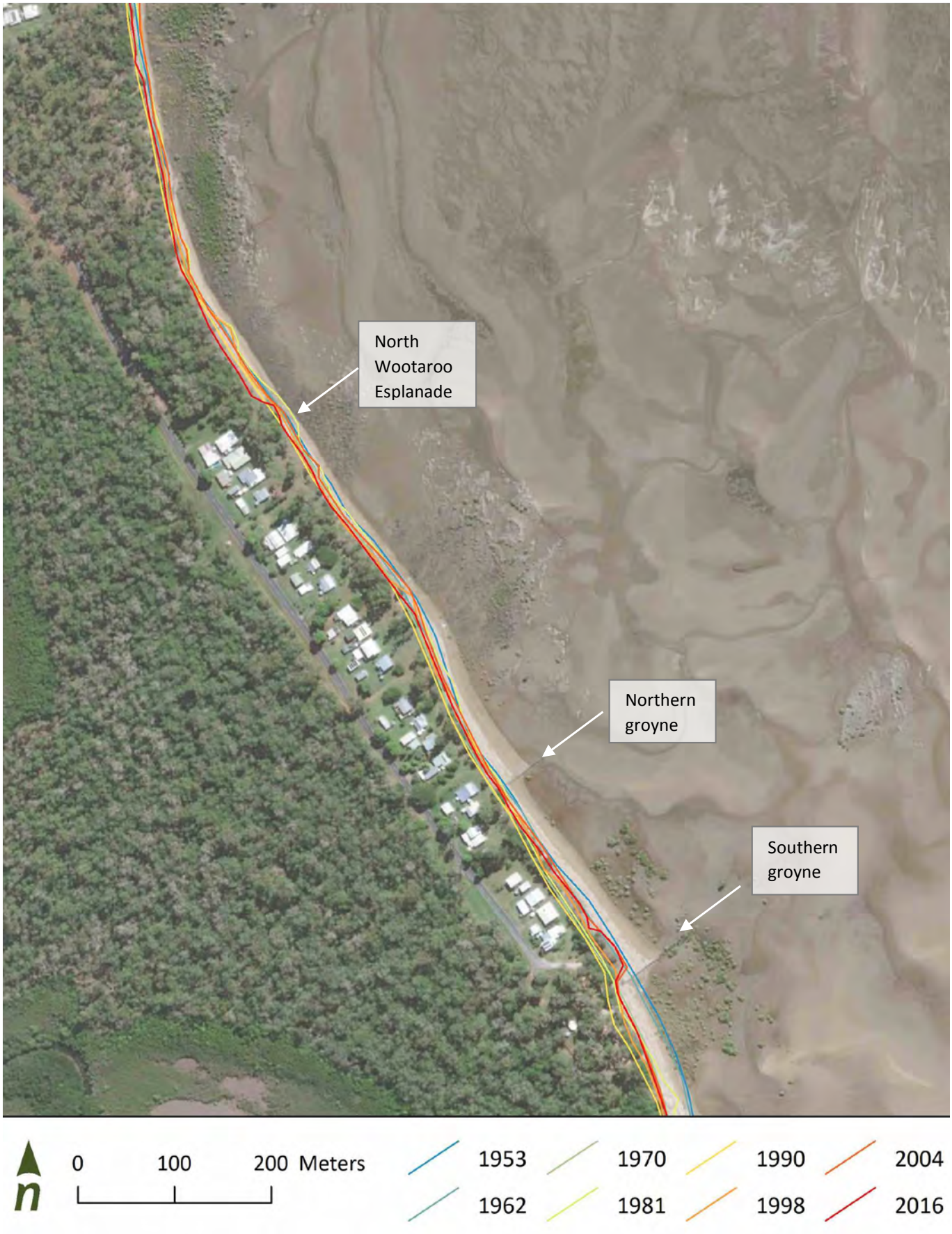


Figure 35: *Historic shorelines digitised from aerial imagery 1953-2016 for the southern Wootaroo Esplanade beach. Change in shoreline location detailed in Table 2 for three locations (north Wootaroo Esplanade, north of southern groyne, south of southern groyne).*

was required to access the beach down the vertical scarp. It has been estimated that up to 10,000m3 of sand was eroded from the beach between 1953 and 2002 (WBM 2006). Over these decades a range of community-led erosion protection works were trialed. These included sections of rock and concrete batter on the scarp, concrete blocks and timber piles established as a wave barrier wall at the toe of the scarp, and trial groyne structures (e.g. Figure 37, Figure 38 and Figure 39). Formal coastal management works were undertaken by Council in 1975. This consisted of a wire gabion groyne constructed at the southern end of Murray Road (Figure 40). The groyne was originally around 1m high and 100m in length. The first 44m of this groyne closest to the shore was then raised by 0.5 m in 1978. A second (northern) groyne was constructed independent to Council in 1992 and extends for around 50m (Figure 41). The groyne is also a wire gabion groyne around 1m high and 1m wide.

The present-day beach form along this section of coast is characterised by a low gradient intertidal zone extending out to broad tidal flats (Figure 41). A moderately steep upper beach extends to the toe of the steep scarp line that is still evident along the shoreline.

The existing trial structures present along the shoreline (rock, concrete and wood materials) have reportedly provided some erosion protection over recent decades, however many are now degraded and scour has out-flanked / undermined many of the structures. These structures may exacerbate erosion impacts during future storm events, by concentrating wave energy and scour in some locations.

The formal groynes have been effective in promoting sand accumulation on the northern side of each groyne, evidenced by historical imagery and current conditions. The accumulated sand provides some protection from storm activity (storm bite erosion) to the residential properties, campground and other assets. However the gabion groynes are susceptible to damage during storm events (and will require periodic repair and upgrade), and the shoreline continues to be susceptible to periodic erosion. Council completed repairs to both groynes in 2020.

Historical imagery and local observations indicate that mangrove areas have expanded to the south of the southern groyne (since groyne establishment), likely linked to the localised change in sediment distribution influenced by the groyne. Mangrove areas have also historically fluctuated along this section of the coast and have been observed to increase and decrease at different locations over time (including areas north of the groynes). This is consistent with the dynamic nature of this section of the coastline. Where established, mangroves provide additional protection for the shoreline from wave energy.

Figure 36: *Erosion scarp in front of Wootaroo Esplanade, with ladder required to access the beach (1976).*

Figure 37: *Historical photos of the southern shoreline and erosion in 1976: Left image - view north along eroding shoreline with remnant wooden groynes, Right – erosion scarp in the order of 2m high, with ladder required to access beach. Photos courtesy of local community members as provided to Mackay Regional Council.*

Figure 38: *Beach in front of Wootaroo Esplanade / Murray Road prior to northern groyne construction (1992).*

Figure 39: *Looking south along Wootaroo Esplanade beach, with concrete block groyne and timber revetments (June 2019).*

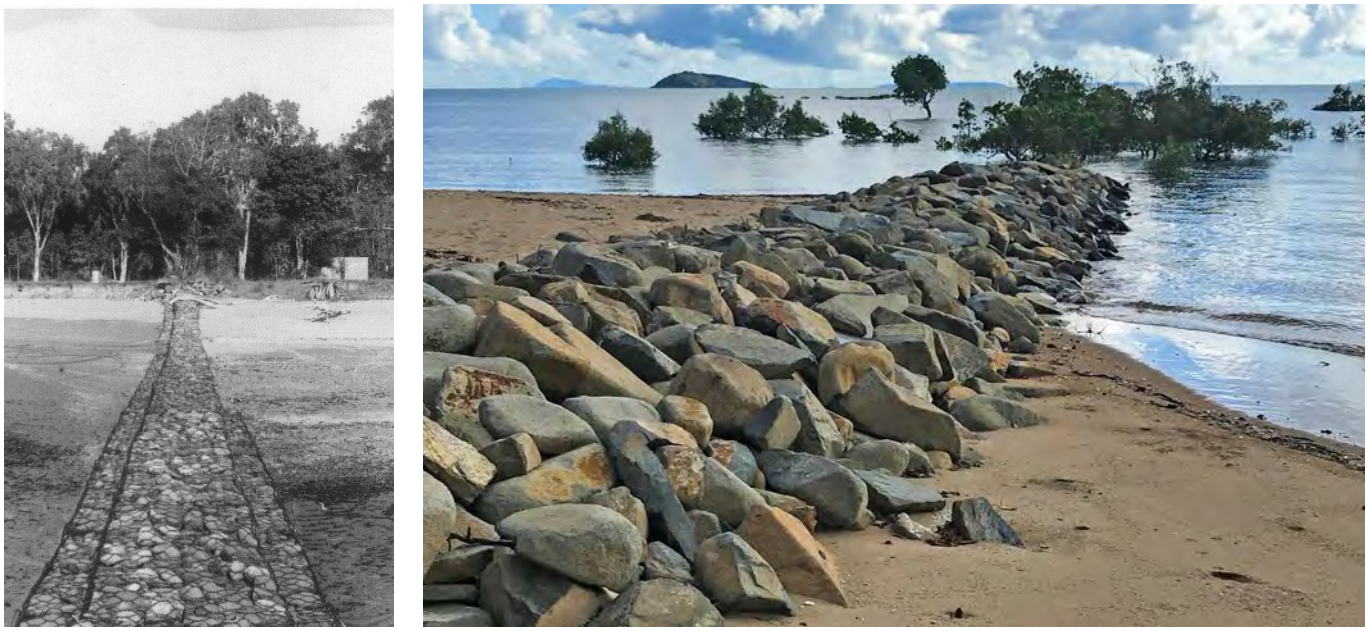


Figure 40: *Left: original southern groyne as constructed in 1975. Right: southern groyne with sand accumulation on northern side, rebuilt in 2019.*

Figure 41: *Northern groyne with sand accumulation on northern side, rebuilt in 2019.*

Figure 42. *St Helens Beach tidal flats (June 2019).*

4.3.6 Coastal hazard areas

Coastal hazards include erosion, storm tide inundation, and long term (permanent) tidal inundation in low-lying areas due to sea level rise.

The State Government define Erosion Prone Areas for the Queensland Coastline. The Erosion Prone Area represents coastal land that may be impacted between now and 2100 by open coast erosion, as well as permanent inundation due to sea level rise (0.8m by 2100). Areas prone to temporary impacts of storm tide inundation are also considered to be up to Highest Astronomical Tide (HAT) plus 2.0m.

A substantial extent of the St Helens Beach shoreline and settlement is situated within the Erosion Prone Area (Figure 25). This includes areas prone to open coast erosion as well as increased tidal area due to sea level rise (HAT + 40m horizonal, and HAT +0.8m vertical). The Erosion Prone Area does not represent a predicted loss of coastal land, however, does indicate that these areas will be increasingly prone to erosion and inundation, and where planning will be required to mitigate coastal hazard impacts. This has implications for longer term strategic planning associated with coastal hazard adaptation. Any works completed to address erosion management over the next few decades should be in the context of longer term coastal hazard adaptation and seek to achieve multiple strategic outcomes.

The majority of the Wootaroo Esplanade/Murray Road area is likely to be prone to storm tide inundation by 2100, while the higher ground around the main beach and boat ramp is not as prone to inundation (Figure 43). Storm tide inundation is the temporary inundation of land due to storm surge associated with extreme events (e.g. cyclones). Any future erosion protection works for the shoreline should consider ways to mitigate storm tide hazards as well (e.g. increasing dune height with beach nourishment).

Figure 43: *Areas prone to storm tide inundation by 2100, based on default HAT+2.0m estimate.*

5 Social Values and Management Issues

This section provides an assessment of the social values, such as cultural values and recreational opportunities and facilities offered by the coastal unit. The focus lies on a sustainable approach to explore recreational opportunities while conserving the natural environmental values of the area. Provision of adequate facilities that cater for a range of interests and abilities is also an important consideration of this plan.

St Helens Beach is one hour's drive, or approximately 50 km, north-west of Mackay. The area is a popular place to visit for locals from Mackay and other domestic tourists, boasting a suite of natural and recreational assets including a camping ground and St Helens Bay, which is a nationally important wetland and recreational fishing destination (DEE 2019).

There are two council managed parks within the coastal unit, St Helens Beach Esplanade Reserve and the St Helens Camping Reserve, which offer between them play equipment, picnic facilities, toilets and a official access point to the beach.

5.1 CULTURAL HERITAGE

The Yuwibara people's physical, spiritual and emotional connection to more than 313,000 hectares of land and waters around Mackay was formally recognised by the Federal Court of Australia on the 25 February 2020. This determination recognises the Yuwibara people's continued connection to land and waters in and around Mackay, north to Bloomsbury, westwards across the coastal plains to the Great Dividing Range and south to Cape Palmerston.

St Helens Beach is highly significant for the Yuwibara people, who are the Traditional Owners of this area. Many coastal settlements throughout the region contain isolated cultural heritage sites, but the St Helens Beach area is described as a cultural landscape (Tonga 2018, pers. comm.). The whole area, including the foreshore, creeks and hinterland, contains a range of cultural heritage sites. These include a fish trap, shell middens and a ceremonial site used for conducting mens-business. Four sites are recorded on the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) cultural heritage register, with at least two additional sites identified, but not yet recorded on the database. Council is committed to managing culturally significant places sensitively in partnership with the Yuwibara people. Council acknowledges the importance of cultural heritage to the area and will work with Traditional Owners to recapture their connection to Country. The camping ground at the southern end of the beach is used regularly for gatherings of the Yuwibara people. There are also shell middens and associated artifacts (such as grinding stones) throughout the area (Mooney and Tonga 2016, pers. comm.). One such shell midden was identified in 2018 in Zone B following Tropical Cyclone Debbie, and is noted as being highly significant to Traditional Owners. It is recommended that council work with the Yuwibara people to protect this shell midden by installing coir logs, thereby slowing erosion. Additional shell middens are suspected to occur south of Zone D.

In the *Mackay-Whitsunday-Isaac Healthy Rivers to Reef Partnership 2018 Report Card* (MWI HR2RP 2019), the St Helens Beach area was given an Indigenous cultural heritage score of D (Poor). This score was calculated based on an assessment of two individual sites and averaging their scores across five indicators. Indicators included physical condition, archaeological value, the level of protection, spiritual value and cultural maintenance. Across both sites, the scores for each of these indicators was found to be within the range of B to E (Good to Very Poor), resulting in an average overall score of D for the area. The scoring emphasises a need for increased protection of cultural assets and increased facilitation of Traditional Owner connection to Country. However, as this assessment was based on limited site analysis, it is recommended that further assessments are undertaken.

The seagrass meadows at the northern end of the coastal unit are culturally important hunting grounds, as they support large numbers of sea turtles and dugongs. Traditional Owners used the coastal area and its associated wetlands for hunting, gathering and other cultural purposes. As such the restoration of natural areas remains of significance to Traditional Owners. Some traditional hunting still takes place today however, Elders no longer permit dugong hunting within St Helens Bay, respecting the area as a dugong sanctuary (Tonga 2018, pers. comm.).

To protect the cultural significance of the area, it would be beneficial to discuss any proposed activities with the Traditional Owners. It would also be beneficial to facilitate additional on-Country visits by Traditional Owners. Surveys of the area by Traditional Owners may reveal many sites or items of cultural significance. In order to do so, it is suggested that Traditional Owners are funded to document finds and outline clear management objectives for preserving the cultural heritage in the area.

The rich cultural significance of St Helens Beach could be shared with the broader community through the design and installation of signage throughout the area. Sites for signs could include St Helens Beach Esplanade Reserve and St Helens Camping Reserve. This signage should be developed in consultation with Traditional Owners.

5.2 RECREATIONAL OPPORTUNITIES

Recreational sites are important as they provide a range of social benefits including opportunities for active and passive recreation, tourism, education and social activities. They also

support community wellbeing and provide opportunities for improving general health through outdoor recreation. Additionally, through signage and interpretation, there is an opportunity to raise awareness of local wildlife and educate people about the natural coastal processes and vegetation that support these species. The *Mackay Region Planning Scheme* (MRC 2017a) outlines council's vision to provide a balanced mix of public Open Space that in turn will provide for a range of active and passive recreational opportunities for the community. Open Space is set aside for recreational and non-recreational activities. Active and passive recreational opportunities are provided to meet the needs of the community, whereas non-recreational Open Space areas are provided for the protection of natural areas, (including environmentally significant vegetation, wildlife habitat areas, waterways, and wetlands) and for the use of land for utilities and storm water management (MRC 2018b). In order to develop an integrated and comprehensive Local Coastal Plan, it is important to consider public use and future opportunities that balance the environmental conservation and recreational needs of this coastal unit.

The *Mackay Region Planning Scheme* (MRC 2017a) was considered when assessing the coastal unit for possible recreational and conservation-based recommendations, including the risks recreation may pose to local wildlife and native vegetation. Environmental sustainability is prioritised in line with the *Coastal Management Guidelines* (MRC 2012), with consideration for providing a range of recreational opportunities in order to meet needs of the broader St Helens Beach and Mackay community. *Council's Open Space Strategy* (MRC 2018b) seeks to achieve recreational diversity and effective distribution of recreational areas, and to create an interactive interface between the environment and the community, and establish a network of Open Space areas accessible to everyone. This Local Coastal Plan seeks to align this policy, community needs and environmental conservation.

St Helens Beach is valued by visitors and residents for its natural and recreational assets. The current residential settlements have been developed over more than sixty years from what were originally simple beach shacks in the 1940s. From the 1960s onwards St Helens Beach has undergone significant changes, with the construction of a boat ramp, playground and sealed road increasing recreational opportunities and visitation to the area. During the development of this plan, residents were asked what they valued most about St Helens Beach, and common responses included the quiet atmosphere, fishing, boating and camping opportunities, the natural environment and wildlife, such as turtles. As a nationally-important wetland, St Helens Bay serves as a locally-important recreational fishing and boating area. The boat ramp and nearby camping area further support St Helens Beach as a popular fishing destination.

The St Helens Beach coastal unit encompasses 4ha of Open Space distributed over three main recreational areas. St Helens Beach Esplanade Reserve is situated in front of Repulse Esplanade, within Zone C, St Helens Camping Reserve and Wootaroo Esplanade at the southern end of the coastal unit, in Zone D. Open Space Recreational Parks are classified into local, district, regional, sport and linear parks to set desired service standards, including allowable features and maintenance. In accordance with council's *Open Space Schedule* (SC6.16) all recreational parks within this coastal unit should provide a garbage bin, drinking water, lighting, shaded seating and play and landscape features offering safe community access and recreational use.

St Helens Beach Esplanade Reserve (Figure 44) is approximately 2.7ha in size and classified as a Local Park. Local parks are designed to function as a frequently-visited but shorter stay recreation destination within convenient walking distance of residents living in an area, and to offer a range of passive as well as active recreational opportunities. As in the case of this recreational open space, where local parks occupy a beachside location, local park can also play an important role in attracting and catering to the needs of day trippers and tourists to an area. In accordance with the park's classification, St Helens Beach Esplanade Reserve provides sheltered seating, barbeque and picnic facilities and playground equipment. The park also boasts a large active play area and basketball facilities (Figure 46). The park is enclosed by a post and rail fence. 'Anne's Walk' (Figure 17), in Zone C south of St Helens Beach Esplanade Reserve, is an unofficial walking track through the beach vegetation, established by the local community. Formalising Anne's Walk could provide additional nature play features for residents and visitors, and the walk may be enhanced by installing interpretive signage related to the value of coastal vegetation or sharing Traditional Ecological Knowledge such as bush-tucker species. Consultation should be undertaken to determine the community's goals for this area.

The St Helens Camping Reserve is managed by Council as a camping area offering the public access to unpowered sites for a nominal daily or weekly fee for up to a maximum 6-week period. The site has been appropriately embellished to function as a long stay destination helping to attract tourist and day trippers to the area. The reserve currently provides access to sheltered seating and formal picnic facilities (including electric barbeques), public toilets and shower facilities, access to potable water and car parking. St Helens Camping Reserve also provides the only official access point to the beach in the coastal unit. The recreational and cultural value of the Reserve may be increased by repainting the amenities block with artwork by Traditional Owners, installing signage, and upgrading the beach access point.

Outside of these designated recreational open space areas, St Helens Beach boat ramp situated at the end of Ramp Road in Zone A (Figure 47) is a major recreational draw card to the area. This boat ramp was significantly upgraded in 2017 to improve high tide access and make it easier to launch. However, there are reported difficulties in accessing the boat ramp, particularly in peak visitation periods such as school holidays. Consequently, many people launch from a nearby unofficial boat ramp (Figure 48). There are also concerns that the upgraded ramp may be causing silt to build up, impacting the seagrass meadow north of Carpet Snake Island. It is recommended that council work collaboratively with Department of Transport and Main Roads and the local community to undertake an assessment of current infrastructure and how it meets the needs of the community.

Figure 44: *St Helens Beach Esplanade Reserve recreational assets.*

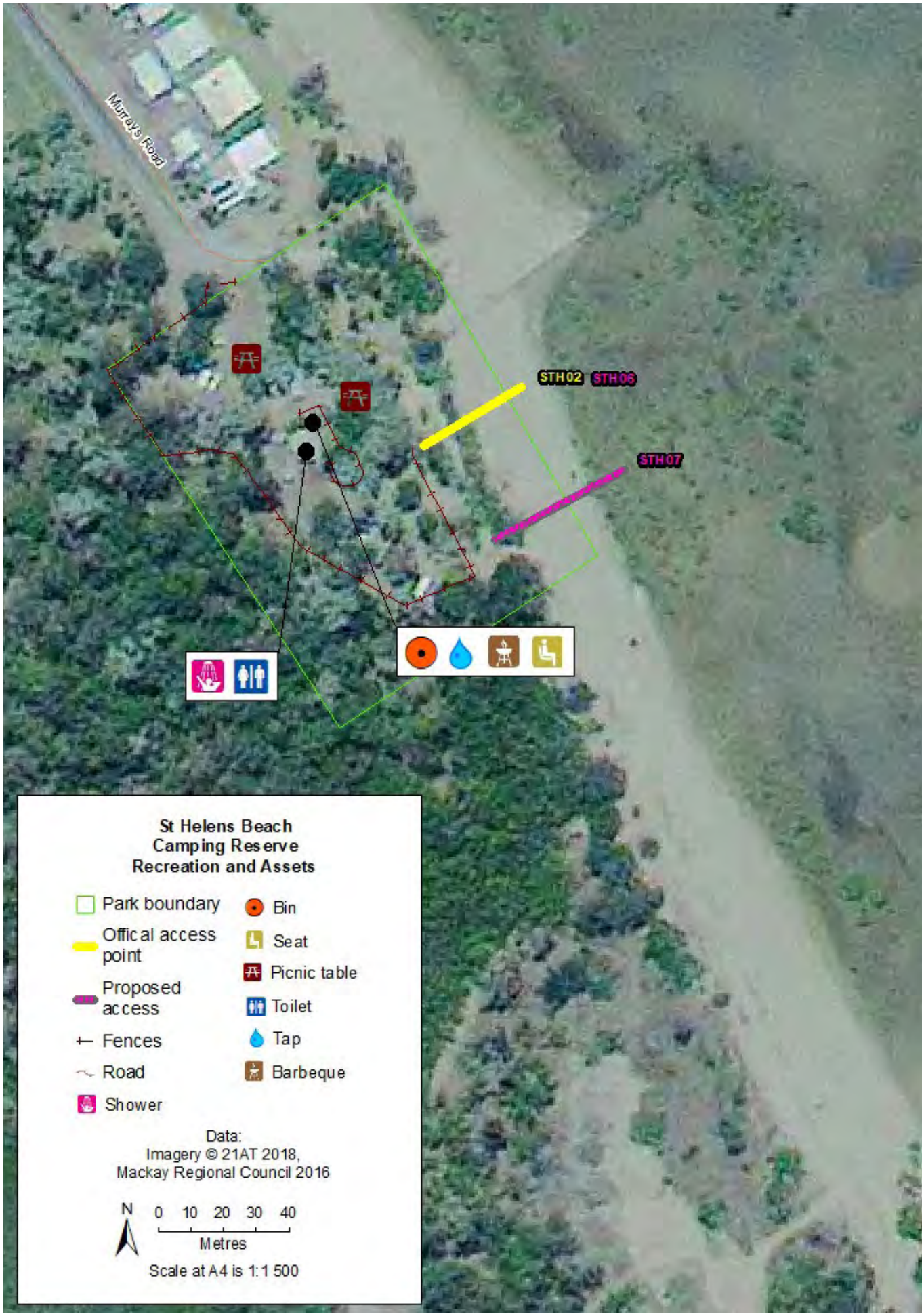


Figure 45: *St Helens Camping Reserve recreational assets.*

Figure 46: *St Helens Beach Esplanade Reserve play area.*

Figure 47: *St Helens Beach boat ramp.*

Figure 48: *St Helens Beach original boat ramp.*

5.3 PUBLIC ACCESS

To prevent the degradation of dune systems and for public safety, it is important for users to stay on designated access tracks. Pedestrian and vehicle traffic displace sand, and where it continually occurs, can lead to localised erosion. Recreational activities/facilities (i.e. walking tracks, picnic facilities etc.) where possible, should only be located outside of the erosion prone area and inside the landward dunal areas (DERM 2011b).

Access to St Helens Beach is predominantly pedestrian, via an official beach access track in St Helens Camping Reserve or unofficial or private tracks (Figure 49). An unfenced, signed track (currently identified as STH02) through the dunal vegetation is currently the only official access track (Figure 50). Without fencing to funnel traffic, this area is frequently accessed by beach goers who unwittingly disturb native plant recruitment and spread weeds.

It is recommended that additional beach access points be installed throughout the coastal unit (Figure 49). At St Helens Beach Esplanade Reserve, users of the play equipment and facilities currently access the beach by walking over the foredune through the coastal vegetation strip. This may have an impact on native recruitment, erosion and weed incursion. It is recommended that two access tracks between Crocker Street and Dewar Street are formalised in the Reserve, and labelled STH01 and STH02, to limit disturbance to native vegetation. It is recommended that vehicle access to the beach, for boat launching purposes only, be allowed at STH01, whilst STH02 should be a pedestrian access only.

Throughout Zone D an additional three access points are recommended to be established, and labelled STH03-STH05, between the houses on Murray Road (Figure 49). These access points will predominantly service the permanent residents at St Helens, and reduce unofficial access through beachfront properties. Council should investigate whether one of these locations is suitable as an all-abilities access point, to increase the accessibility of the foreshore to the community. At the southern end of the coastal unit STH07 should be formalised as an access point suitable for vehicles. This will serve as an emergency access point as well as provide the community access for launching boats from the beach at low-tide. All access points should be constructed with beach access signage. The signage identifying the current official access point (currently identified as STH02) should be updated to STH06 reflect the proposed new numbering of access points (Figure 49).

A number of unofficial access points exist leading from private property, through dune vegetation and onto the beach (Figure 51). These paths (Figure 51) facilitate the loss of native vegetation cover, encourage weed colonisation and increase localised erosion processes via pedestrian traffic. Regular disturbance contributes to sand compaction and limits vegetation recruitment and should be discouraged through official access points and signage (regulatory and informative). Well-placed official formalised tracks should be created to provide the most direct route to beaches thereby limiting the necessity for the public to create unofficial access points. The unofficial pedestrian access between the proposed accesses STH04 and STH05 is also a safety risk, and should be removed (Figure 49).

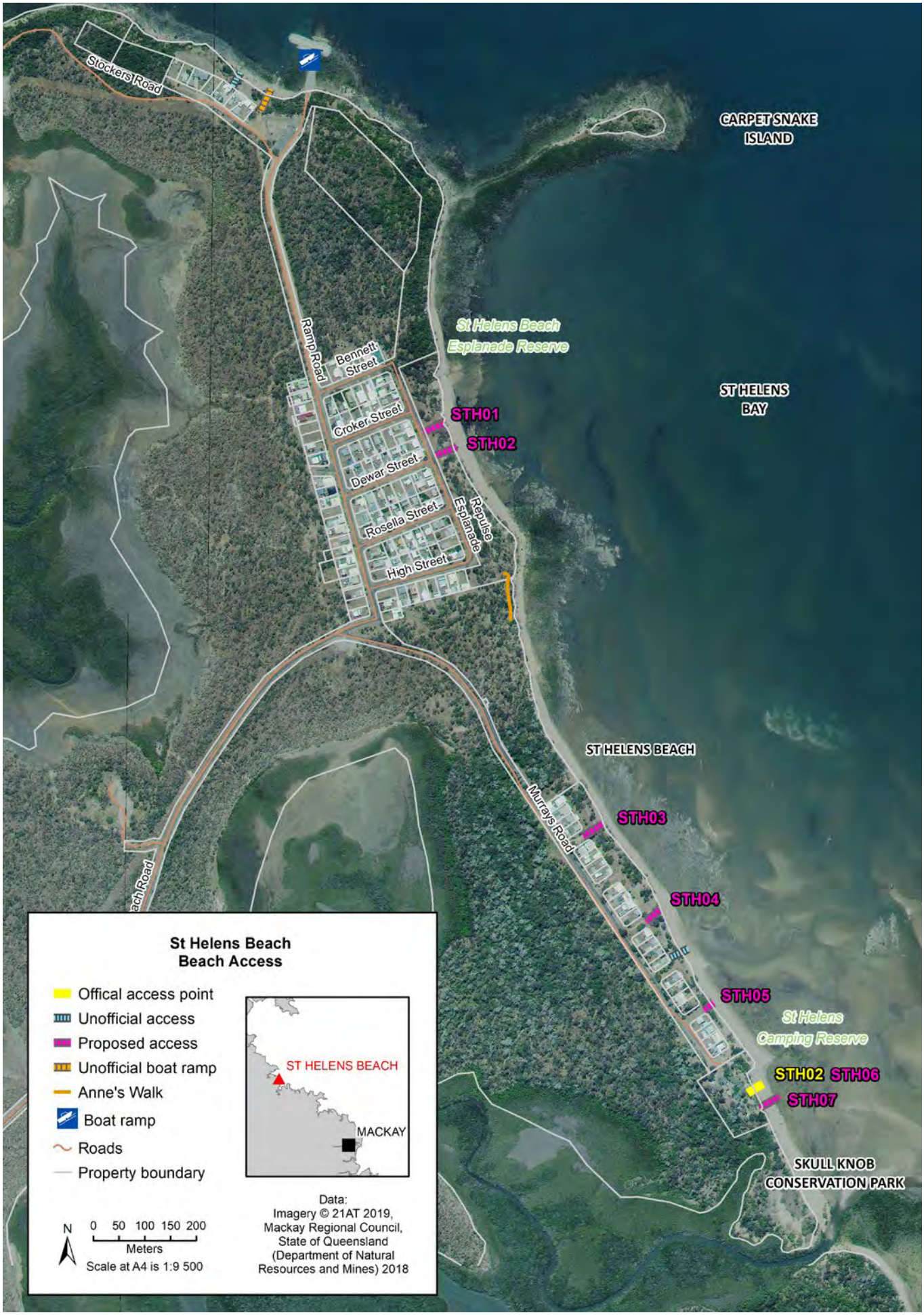


Figure 49: *St Helens Beach access points.*

Figure 50: *Official access point (currently identified as STH02) at St Helens beach.*

Figure 51: *Unofficial access point to St Helens beach.*

5.4 SIGNAGE

Signage provides educational and interpretive opportunities for visitors and increases the value that locals place on the natural environment. Signs can highlight areas of high value, provide information about current projects and advise of site-specific restrictions or hazards. Beach access signage is present at the landward and seaward end of each beach access track throughout the coastal unit. It is recommended that signage be regularly audited and updated where required to ensure consistency and accuracy.

As discussed in Section 4.2 (Wildlife), it is recommended that the dugong signage at the top of the boat ramp is updated to include appropriate boat speeds and safety measures. Notably, there are fourteen signs at the top of the boat ramp (Figure 52). It is likely that the large number of signs and associated information results in reduced uptake/interpretation by viewers. Council may consider both rationalising and moving some of the signage to increase uptake of the messaging.

When formalised, Anne's Walk in Zone C may benefit from signage. Signs could include information related to the importance of coastal vegetation, dune health and function, the nearby regionally-significant shorebird roost, and/or share cultural heritage information such as bush-tucker species. Council should consider that Anne's Walk is a community-generated project, and therefore the community should be consulted to determine what their wishes are in terms of formalising the path and/or installing signage.

Additionally, new signage designed in consultation with Traditional Owners could be displayed at St Helens Camping Reserve to highlight the cultural values of the area. Interpretive signage, developed in consultation with Traditional Owners, could enhance visitor experience and ensure that the importance of cultural heritage is reflected and appreciated by locals and visitors.

Updating, repairing and installing new signs throughout the coastal unit near beach access points or sheltered seating and picnic areas is recommended.

Figure 52: *Signage at the top of St Helens Beach boat ramp.*

5.5 ECONOMIC VALUES

Beaches are important economic assets as well as natural resources, as they provide services to people and property that have an economic value, including reduced storm damage, together with recreational and tourism opportunities (Strong 2005).

The tourism industry is important for the Australian economy, comprising approximately three per cent of gross domestic product in 2014-15 (Productivity Commission 2015).

Australia's tourism industry is dominated by the natural environment, with national parks and protected areas forming the basis of nature-based tourism experiences (Weaver *et al.* 1999). Beaches are the most popular coastal attractions for visitors, providing opportunities for a range of activities including bushwalking, whale watching and fishing (Clarke and Johnston 2017).

Beach visitors generate income for the local economy through their expenditure. Spending by tourists is a component of the economic activity across a variety of sectors including accommodation, cafes and restaurants, transport and storage, retail trade, cultural and recreational services and education

(Pambudi *et al.* 2009). Income generated by the coastal tourism sector is highly dependent on the quality and extent of beach systems (Jones and Phillips 2007).

Ecotourism is a significant and growing sector of the tourism industry and provides a way to reconcile tourism and conservation (Weaver 2001). By marketing natural values, ecotourism can maintain the aesthetic appeal of coastal tourist areas while deriving economic value, and simultaneously produce environmental benefits (Clarke and Johnson 2017).

Beach and dune environments are among the most valuable natural habitats on the coast, providing environmental services, landscape values and habitat for marine and terrestrial plants and animals which can serve to attract tourists as well as provide amenity for local residents (James 2000). The costs associated with recreational and tourist usage of beaches includes the cost of infrastructure provision and maintenance.

Beaches provide goods and services to many stakeholders, with a range of market and non-market values which can be worth millions of dollars per year. The way people value the natural environment however can vary. Value can be associated with direct uses, such as fisheries or tourism, as well as indirect uses, such as mangroves providing nursery habitat for juvenile fish species. Indirect uses are usually found outside the marketplace and are effectively unpriced. Determining the full value of a natural asset is challenging and often overlooked, however if no monetary value is placed on environmental goods and services there is a risk that they will be perceived as having no value (zero worth) and may be vulnerable to exploitation (Kirkpatrick 2011).

Coastal resources in the Mackay region are highly sought after for competing uses including residential, commercial, tourism and recreation. Effective management is required to ensure that the natural values and attributes of the coast are preserved while economic development and population growth are accommodated (EPA 2004).

Climate change is likely to have a range of direct and indirect economic impacts on recreation and tourism in coastal areas. Local and state governments will need to invest in natural assets to ensure the continuation of a strong tourism culture and investigate opportunities to diversify the tourism image for beach-focused destinations while balancing the value of natural coastal assets against trade-offs for other uses such as industry and development (Kirkpatrick 2011).

St Helens Beach provides a range of direct and indirect economic values, though the exact monetary value of these services has not been quantified. The natural assets and built infrastructure of St Helens Beach, in particular the camping Reserve and boat ramp (including the net free fishing zone), are drivers for tourism and visitation to the area. Whilst there are no shops within the St Helens Beach area, visitation likely results in direct local expenditure in nearby towns including Calen and Mackay. The purchase of food, petrol, boat fuel, and camping equipment are examples. Indirect economic values of St Helens Beach include the environmental value of the St Helens Bay wetland complex and mangrove ecosystems to fisheries, and the recreational value of the beach's natural and built assets to visitors and locals.

5.6 WASTE DUMPING AND LITTER

Green and general waste has aesthetic, social and conservation repercussions. Litter and green waste reduce the visual appeal of beaches, present health threats to visitors (e.g. toxic waste, glass, plastics and sharps etc.) and compromise vegetation condition. Green waste, such as palm fronds and lawn cuttings smother large sections of ground cover vegetation throughout the coastal unit. Plastics and other general waste often wash out to sea, presenting dangers for marine wildlife including birds, fish, sharks, turtles and marine mammals. Marine debris may lead to drowning, or cause injury or death through entanglement and internal injuries, or from starvation following ingestion. Waste, including plastics, can also wash onto the shore from other areas.

Zones A, B and C are relatively free of waste dumping, though isolated piles of palm fronds can be found throughout St Helens Beach Esplanade Reserve. The green waste should be removed from the foredune, to protect visual amenity and reduce fuel load for wildfire.

In response to erosion prevention recommendations provided by the Beach Protection Authority in approximately 1984 (Sutherland 2020, pers. comm.), a range of community-lead erosion protection works such as concrete batters, concrete blocks and timbers piles have been trialed along the toe of the scarp within Zone D (Figure 14, 53 and 54). While providing some protection against erosive processes, the structures have limited colonisation of stabilising native vegetation such as pineapple sedge (*Cyperus pedunculatus*), sea purslane (*Sesuvium portulacastrum*), birds beak (*Thuarea involuta*) and goats foot (*Ipomoea pes-caprae*), which are present in other areas along the beach. In addition to this, timber piles have been used to construct a makeshift wall in front of the foredune, which runs the majority of the length of Zone D.

The current *Shoreline Erosion Management Plan* (SEMP) for St Helens Beach was written in 2006. It is recommended that an updated SEMP be compiled for the area, before any action is taken to remove the various past efforts to control erosion. It is important to consider the impact that removing these structures may have on destabilising the dune. Any work will need to be undertaken in conjunction with community consultation and will require the agreement of the community.

Figure 53: *Rock and dirt dumped on foredunes.*

Figure 54: *Concrete poured over foredunes.*

6 Climate Change and Management Issues

Climate change is the term used to describe long term changes in global weather patterns, and the gradual increase in mean global temperature. There is strong evidence that suggests that the gradual warming trend over the last fifty years has been driven largely by human activity, for example, the burning of fossil fuels, deforestation and intensification of agriculture (The Royal Society 2010). Global population increases have also been a likely contributor. Climate change is having, and will continue to have, significant impacts on lives and ecosystems on which we depend.

Council's *Climate Change Adaptation Policy* (MRC 2018c) recognises that climate change has the potential to impact the Mackay region. The policy outlines the proactive approach employed by council to take a leadership role by adopting a strategic response to impacts and opportunities that may eventuate from climate change, as well as facilitate greater awareness of the causes and effects of climate change. Council's *Environmental Sustainability Strategy 2017-2022* (MRC 2017b) further reinforces council's vision and commitment.

Coastal areas are highly exposed to climate change with sea level rise being one of the greatest threats. The best known model relating shoreline retreat due to an increase in local sea level is that proposed by Per Bruun (1962) (Figure 55).

Projected sea level rise (0.8 m by 2100) is expected to increase erosion and damage property and infrastructure (DERM 2011b). The response of Australian coastal ecosystems and landforms to climate change will vary, but most are expected to involve shoreline recession, vertical accretion of sand, increased saline inundation of wetlands, and the modification and southward shift of habitat (Australian Government 2013). Additionally, many intertidal ecosystems such as mangroves, seagrass and tidal flat communities will decline.

Key climate change messages for the wet tropics Natural Resource Management cluster, which encompasses the Mackay region, are displayed in Figure 56 (Abbs *et al.* 2015). Current predictions suggest that much of the dune system will be inundated by 2100 (Queensland Government 2011). Maintaining and improving the condition of a buffer area of coastal vegetation, where possible, will provide the best opportunity to build resilience into these ecosystems to cope with changes into the future. *Mackay, Whitsunday and Isaac Climate Sustainability Plan 2016-2020* (Reef Catchments 2016) contains forecasts local to the Mackay region. Figure 56 also highlights other key changes associated with climate change, such as increased temperatures and more severe tropical storms.

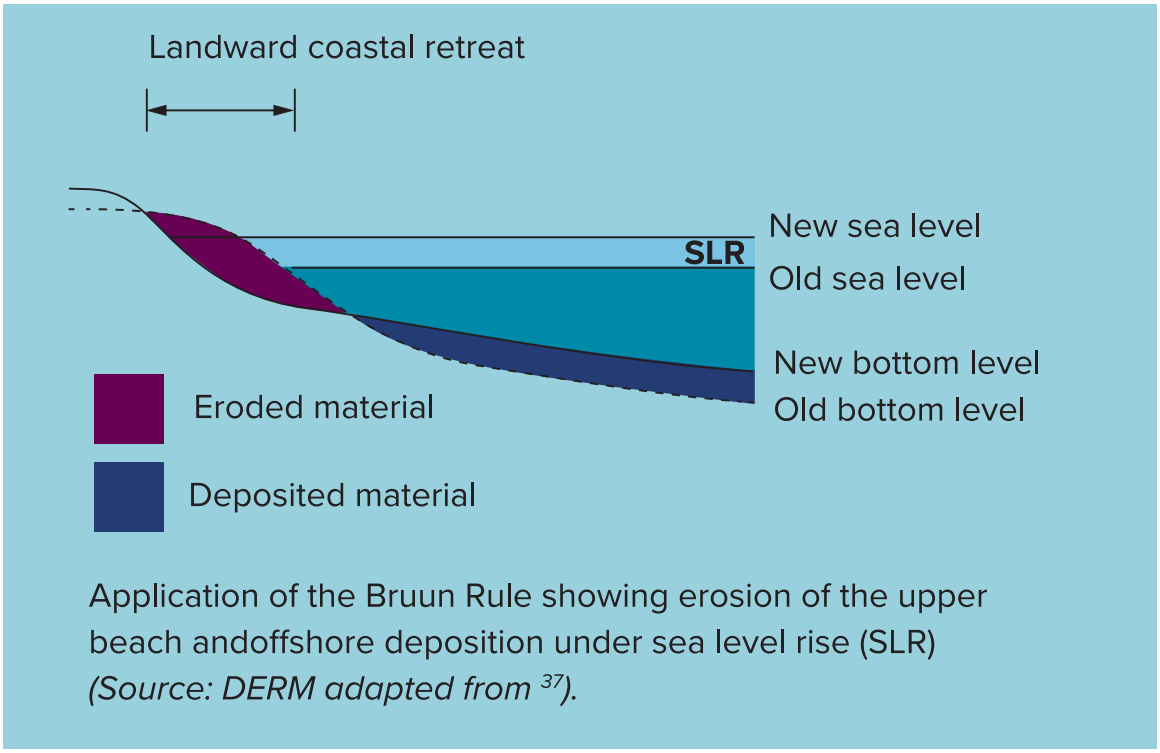


Figure 55: *The Bruun Rule showing erosion of the upper beach and offshore deposition under sea level rise (SLR) (Source: DERM).*

One of the most significant impacts for St Helens Beach as a result of climate change will be the rising sea level (Figure 24). The challenge for future planning will be to identify suitable ecological retreat zones for developed sections of coastlines, informed by geomorphic processes, to accommodate climate change processes and preserve unique habitat in specific geographic regions. For example, it may be important to limit development around estuary areas and coastal wetlands and waterways, in order to preserve a zone to accommodate ecological retreat. An updated *Shoreline Erosion Management Plan* (SEMP) and adaptation planning is recommended to ensure that this is comprehensively considered to mitigate risk to social and environmental values in the area. Council's *Coastal Erosion Protection Works – Contribution and Costs Recovery Policy* (MRC 2018a) establishes the circumstances under which council may lead adaptation planning and other coastal protection works.

Rising temperatures will probably see the migration of vegetation communities southward or to higher elevations in order for the plant assemblages to stay within their optimal physiological limits (Huntley 1991). This migration could be facilitated by the revegetation of coastal zones. The movement of communities down the coast would be more protected if the area was already vegetated and thereby not exposed to mowing and other anthropogenic influences. St Helens Beach should be allowed to revegetate naturally to contribute to this coastal vegetation strip.

The increased frequency of extreme weather events, such as storms, is likely to have significant impacts on the foredunes at St Helens Beach. The capacity of foredunes to protect inland areas and provide ecosystem services such as climate and nutrient regulation relies on the replenishment of sand through longshore drift, stabilisation from vegetation and reservoirs of sand held within the foredune and hind dune areas. Foredunes act as barriers against the energy of waves and tides and are a source of sand during periods of erosion. They protect areas behind them from wave damage and saltwater intrusion. Vegetated foredunes are protective and restrict wind, sand and salt spray blowing inland from the ocean, thereby allowing a more complex vegetation community to develop on the hind dunes. Loss of these foredunes due to more extreme wave events as well as sea level rise will therefore have critical impacts on the structures and vegetation communities which are currently protected by the foredunes.

KEY MESSAGES FOR THE WET TROPICS

Average temperature will continue to increase in all seasons.

More hot days and warm spells.

Changes to rainfall possible but unclear.

Increased intensity of extreme daily rainfall events.

Mean sea level will continue to rise. Height of extreme sea-level events will also increase.

Fewer but more intense tropical cyclones.

On annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall.

Figure 56: *Key climate change messages for the wet tropics Natural Resource Management (NRM) cluster (Source: Abbs, D. et al. 2015).*

Increased storm intensity predicted with climate change makes stabilising coastal strips in front of infrastructure important for risk mitigation. The use of vegetation is important to bind sediments together and reduce sediment loss. The dune system throughout Zones C and D currently has little capacity to be resilient to storm events.

To protect the tidal flat communities that extend west of the coastal unit and mangroves (Figure 57), adjacent land should remain free of development and infrastructure to allow for migration of these communities as sea level changes occur.

Residents of the coast are already familiar with the risks of living close to the ocean, such as storm surges, cyclones and erosion. However, the intensity of these threats is expected to increase with a warming global climate, so it is important to understand and prepare for this. Elevated sea levels (during episodic storm events) are identified as the major cause of periods of high rates of erosion at St Helens Beach. As the incidence of storms is likely to increase, erosion processes will likely also accelerate. It is important to protect the foredunes for the coastal protection ecosystem services they provide.

Figure 57: *Tidal flat communities at St Helens Beach.*

7 Recommended Activities

Recommended activities have been prioritised to assist council when planning works. Each activity has been ranked as High, Medium or Low priority relative to its contribution towards protecting, improving or enhancing environmental and/or recreational opportunities within the coastal unit:

1. **High priority** activities are critical to the protection of environmental or social values.
2. **Medium priority** activities are those which will significantly improve environmental or social values.
3. **Low priority** actions are those which will enhance environmental or social values.

Table 2: Recommended activities for the St Helens Bach Local Coastal Plan.

RECOMMENDED ACTIVITIES			PRIORITY
Zone A | North end of Ramp Road to Carpet Snake Island			
1	**Vegetation management**		
	1.1	Work with State Government to control major target weed species including Guinea grass, and lantana.	**Medium**
	1.2	Monitor and manage other problematic weed species including residential garden escapees.	**Low**
2	**Recreational opportunities**		
	2.1	Work collaboratively with Department of Transport and Main Roads, other relevant authorities, stakeholders and the local community to undertake an assessment of current infrastructure and how it meets the needs of the community.	**High**
	2.2	Work with the relevant authorities and stakeholders to rationalise and improve signage at the boat ramp to increase uptake of messaging and ensure relevance.	**Medium**
	2.3	Update wildlife protection signage to promote/enforce maximum boating speeds and include marine turtles.	**Low**
Zone B | Carpet Snake Island to north of Bennett Street			
3	**Vegetation management**		
	3.1	Work with the State Government and local residents to ensure the state land is appropriately managed (in line with the current standard) and prevent further encroachment or loss of native vegetation.	**Medium**
	3.2	Work with State Government to control major target weed species including Singapore daisy, Guinea grass and lantana.	**Medium**
	3.3	Monitor and manage other problematic weed species including residential garden escapees.	**Low**
4	**Cultural heritage**		
	4.1	Work with Traditional Owners to install erosion mitigation measures to protect identified shell middens and monitor impact.	**High**
Zone C | St Helens Beach Esplanade Reserve and Repulse Esplanade coastal strip			
5	**Vegetation management**		
	5.1	Work with State Government to control major target weed species including Guinea grass, Singapore daisy, mother-of-millions and lantana.	**High**
	5.2	Work with the community to plan, develop and commence a program of staged vegetation rehabilitation activities to enhance coastal vegetation and remove weed species in partnership and with agreement of the community.	**Medium**

5	5.3	Monitor and manage other problematic weed species including juvenile coconuts, cobbler's peg, periwinkle, and other garden escapees.	**Medium**
6	**Recreational opportunities**		
	6.1	Consult with community about local goals for 'Anne's Walk'. Consider formalising, installing signage and advertising the walk.	**Medium**
7	**Access management**		
	7.1	Formalise the existing vehicle access in St Helens Beach Esplanade Reserve north of Dewar Street (STH01) and erect signage to ensure this access is used for boat launching purposes and emergency access only.	**High**
	7.2	Install new beach access point in St Helens Beach Esplanade Reserve opposite Dewar Street (STH02).	**Medium**
Zone D | Murrays Road coastal strip and St Helens Camping Reserve			
8	**Vegetation management**		
	8.1	Control major target weed species including Guinea grass and lantana.	**High**
	8.2	Supplement removed weed species with native vegetation, particularly along the frontal dune, in partnership and with agreement of the community.	**Medium**
	8.3	Monitor and manage other problematic weed species including juvenile coconuts, cobbler's peg, periwinkle, Seaforth burr, red natal and garden escapees.	**Low**
	8.4	Work with the community to plan, develop and commence a program of staged vegetation rehabilitation activities to enhance coastal vegetation and remove weed species in partnership and with agreement of the community.	**Medium**
	8.5	Control weeds on and around well used areas such as unofficial access tracks.	**Medium**
	8.6	Work with State Government to facilitate protection and appropriate management of significant native vegetation on bordering land parcels.	**Low**
9	**Recreational opportunities**		
	9.1	In consultation with Traditional Owners, develop and install interpretive signage to highlight cultural heritage values of St Helens Beach and its surrounds.	**Medium**
10	**Access management**		
	10.1	Install beach access points throughout Wootaroo Esplanade (STH03-05). Investigate the suitability of these locations for an all-abilities access point.	**High**
	10.2	Upgrade existing official access point (currently identified as STH02) and modify numbering to STH06, to align with other access points.	**High**
	10.3	Formalise the vehicle access point south of access STH06 (STH07) and erect signage to ensure this access is used for boat launching purposes and emergency access only.	**High**
	10.4	Remove unofficial access between proposed accesses STH04 and STH05.	**Medium**
11	**Waste management**		
	11.1	Work with the community to develop suitable solutions to manage palm frond waste.	**Low**
	11.2	Work with the community and in accordance with Shoreline Erosion Management Plan to develop suitable erosion controls.	**Medium**

12	**Erosion management**		
	12.1	Minimise disturbance to dunes and vegetation along all shoreline areas and encourage vegetation establishment and dune accretion.	**High**
	12.2	Investigate the viability of removing damaged / degraded unofficial works as part of the Shoreline Erosion Management Plan review.	**Medium**
	12.3	Continue to maintain existing official groynes.	**High**

Other activities across multiple zones			
13	**Erosion management**		
	13.1	Minimise disturbance to dunes and vegetation along all shoreline areas and, encourage vegetation establishment to provide additional resistance to erosion.	**High**
	13.2	Update the St Helens Beach Shoreline Erosion Management Plan or develop and implement actions for St Helens Beach as part of a region wide Coastal Hazard Adaptation Strategy.	**High**
14	**Cultural heritage**		
	14.1	Engage Traditional Owners to undertake cultural heritage surveys of the area and outline clear management objectives for the preservation of cultural heritage within the coastal unit.	**Medium**
	14.2	Work with Traditional Owners to reinstate connection to Country.	**Low**
15	**Signage**		
	15.1	Audit all beach access signs across the coastal unit and update or install: • Signage at the landward end of each beach access point that clearly identifies the beach access number, restricted activities, hazards present and provides information on the appropriate first aid treatment for marine stingers. • Beach access numbering signage at the seaward end of each beach access point.	**Low**
16	**Climate change**		
	16.1	Consider how to manage future predicted reduction in coastal land to retain buffer above the high tide mark (e.g. rolling boundaries).	**Medium**
	16.2	Plan for retreat as required.	**Medium**
	16.3	Engage the community in an educational event or campaign to explain sea level rise and its likely extent and impact.	**High**
	16.4	Review existing revegetation list to ensure that species reflect diversity of all Regional Ecosystems present in coastal unit and in preparation for future predicted climates.	**Low**
17	**Legislation and local laws**		
	17.1	Use available legislation to protect existing native vegetation on Esplanade and Reserve tenure as required.	**Medium**
	17.2	Protect regionally significant shorebird roost sites.	**High**
	17.3	Review and update this document in line with changing legislation.	**Low**

18	**Education**	
	18.1 Partner with Coastcare and others to deliver education programs about: • Coastal ecosystem processes and the role of native dune vegetation in relation to erosion and accretion cycles. • Local weed species and the use of local native species in residential gardens. • Garden waste and general waste disposal. • Responsible pet ownership and how to protect native wildlife.	**Low**
19	**Vegetation maintenance**	
	19.1 Continue to protect and enhance vegetated dune systems.	**Medium**
	19.2 Work with the State Government to facilitate protection and appropriate management of significant native vegetation on State land.	**Medium**
	19.3 Work with residents to remove priority garden-escapee weeds, supplying 'Are Your Garden Plants Going Bush?' brochure.	**Medium**
20	**Monitoring**	
	20.1 Undertake beach profile monitoring to record and assess change over time and monitor the impacts of sea level rise and the changing dynamics of coastlines to guide future coastal planning and works. • Review profile changes where different protection works are implemented – including the groynes, dune re-building, and vegetated areas. • Use monitoring results to inform future coastal management works for St Helens Beach (adaptive management).	**Low**
	20.2 Consider a regional study on the long term sediment (sand) supply for the Mackay coastline.	**Low**
	20.3 Monitor, or in partnership with others, assist with the monitoring of shorebirds and turtles.	**Low**
21	**Fire management**	
	21.1 Develop a fire management plan for St Helens, in consultation with relevant stakeholders.	**High**

8 Implementation and review

The implementation of the St Helens Beach Local Coastal Plan will occur on a prioritised basis as resources become available. In addition to Council's Natural Environmental staff and Natural Environment Levy funding, multiple external opportunities for funding and resources to assist in the implementation of the Local Coast Plan exist. These include:

- Federal Government grant opportunities.
- State Government grant opportunities.
- Corporate grant opportunities.
- Regional Natural Resource Management (NRM) group (Reef Catchments Mackay Whitsunday Isaac) partnerships.
- Specialist organisations with interest in the Reserve (such as the Mackay and District Turtle Watch Association, Birdlife Mackay, and Queensland Wader Study Group).
- Local community groups.
- Local community volunteers as part of the Coastcare program.

A formal review of the St Helens Beach Local Coastal Plan should take place every five years as feasible. However, council may seek to update the plan at any stage based on the results of monitoring programs, and in line with further protecting the natural environment values of the area with consultation of the St Helens Beach Community.

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10 Appendices

APPENDIX 1: Clarke Connors Range Fire Management Guidelines

Introduction

Reef Catchments and the Clarke Connors Range Bushfire Consortium

Reef Catchments is a community based, not-for-profit organization that has a proven track record in advancing natural resource management in the Mackay-Whitsunday Region. Reef Catchments works seamlessly across the private and all levels of the public sectors to deliver the results where they matter. For more information andcontact details visit the website www.reefcatchments.com.au

The Bushfire Consortium was formed to begin reducing the threat of inappropriate fire on the outstanding natural and economic values of the Clarke-Connors Range on the Central Queensland coast. This area experiences an extremely variable climate and satellite imaging illustrates that numerous large and intense dry season wildfires have occurred over the last 10 years. The concern is that a drier and hotter climate may further increase the incidence of these fires with consequent environmental and economic impacts. Rural communities recognise the magnitude of these fires, and their effects on life, property, productivity, and the environment. However, the wider community has not had access to good information on appropriate fire management practices until now.

Reef Catchments, in partnership with Volunteer Rural Fire Brigades, Government and non-Government landholders, and the Queensland Fire and Rescue Service, has taken up the challenge of providing the best information available on fire management and planning in the region. These Fire Management Guidelines are the culmination of extensive discussions with experienced members of Volunteer Rural Fire Brigades and other respected fire managers and fire scientists.

These Guidelines are one of the products of the Bushfire Consortium and are intended to be used by Volunteer Rural Fire Brigades and landholders who are on the front line in managing fire in rural communities. They are intended to be used to help land managers plan hazard reduction burning, and in undertaking planned burns for improved production and conservation outcomes.

Using these guidelines

These Fire Management Guidelines have been developed for 12 landscape types in the Mackay Whitsunday region. These landscape types are composed of vegetation types that require similar fire prescriptions.

Four important factors to consider when planning for fire management are:

1. Fire Frequency - how often should an area be burnt.
2. Fire intensity - how hot does the fire need to be.
3. Season - what time of year will usually provide the desired conditions for a planned burn;
4. Burning mosaic - the percentage of ground cover remaining unburnt after a fire.

Other important factors to consider are fuel loads, wind speed, humidity, fuel curing, slope and aspect.

These guidelines are not intended to account for all circumstances. Seasonal, yearly and even daily conditions can vary dramatically. Plan ahead to carry out burns when conditions are suitable and always obtain and adhere to conditions of a permit from your fire warden.

Green - Under most circumstances the number of years between burns should fall within the GREEN range. This range is generally considered appropriate for fire hazard management, production and conservation outcomes.

Orange - Under some circumstances there may be a need for more or less frequent fire but this should fall within the ORANGE range. Generally, this would occur as a 'one off' e.g. two fires in 3 years to reduce a lantana infestation.

Red - Generally, it would be considered undesirable for fire frequency to fall within the RED range. For example these long periods of time between fires would result in undesired vegetation thickening and loss of pasture productivity.

Note. Defining frequency by 'Years' can be misleading e.g. in times of drought or particularly high rainfall. Some fire managers prefer using 'average years.' (defined by having received +/- 20% of the local average annual rainfall by May).

Green - Under most circumstances the desired conditions will be available within the GREEN range of months.

Orange - Desired fire conditions will sometimes fall within the ORANGE range of months and/or the specific requirements for a particular burn will differ in a particular circumstance e.g. Storm burning requires relatively high soil moisture.

Red - Under most circumstances, conditions within the RED range of months would result in damaging fire and/or fire that is difficult to control.

Patchy fuels produced by mosaic burns can be very effective in reducing the intensity and spread of wildfire without risking the complete loss of pasture grasses, loss of soil and nutrients, weed infestations or environmental damage that sometimes result from complete removal of the ground layer from large areas.

Different fire intensities perform different land management tasks as described within the guidelines.

LOW intensity fire is < 1m in height.

MODERATE intensity fire is < 2m in height.

HIGH intensity fire is > 2m in height.

The Clarke-Connors Range Bushfire Consortium is a Reef Catchments initiative with funding support from the Australian Governments Caring for Our Country and Queensland Governments Blueprint for the Bush.

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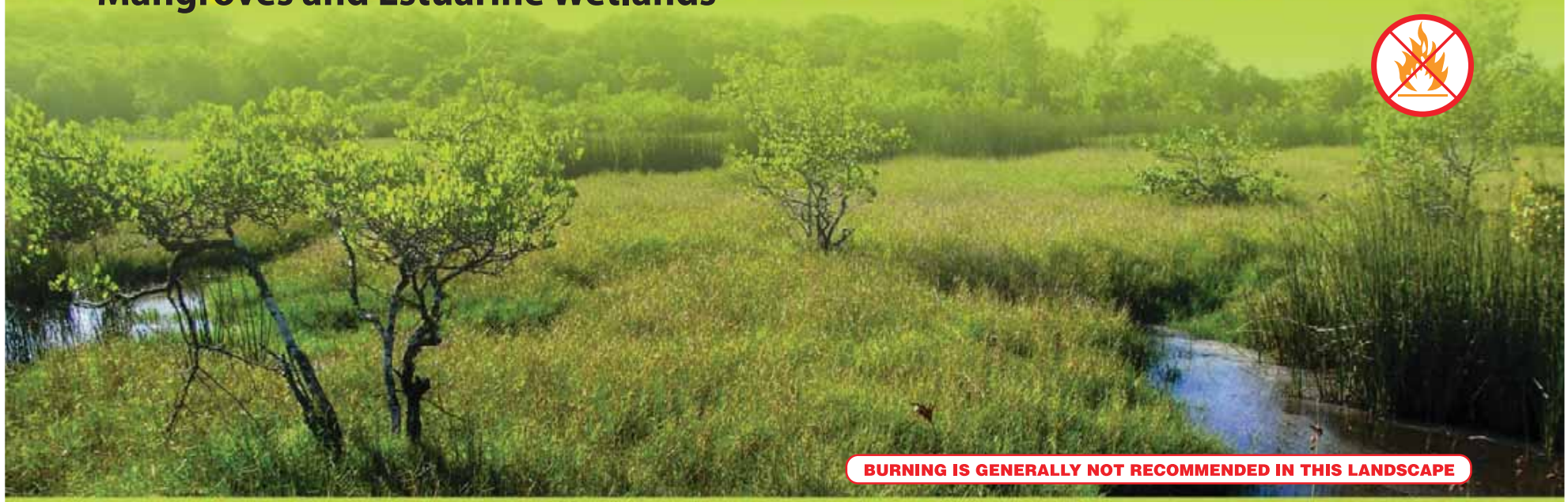
The Clarke Connors Range bushfire consortium

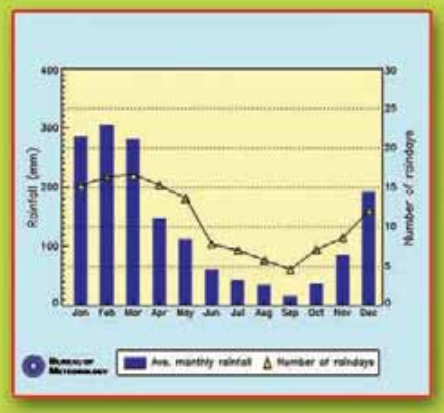
Mangroves and Estuarine Wetlands

Landscape 1



BURNING IS GENERALLY NOT RECOMMENDED IN THIS LANDSCAPE

Mangroves, saltmarsh, saltwater couch, areas of saltpan and fringing melaleuca forests and pandanus.



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1

Hazard Reduction

Saltmarsh and saltwater couch grasslands are regularly inundated by high tides which maintain high soil moisture and ensure continual green growth throughout the year. Because of this these areas rarely represent a fire hazard risk. Risk is further minimised by the fact that the grasslands rarely accumulate large amounts of fuels and tend to be broken up by patches of saline clay and sparse saltmarsh.

The native ground cover within fringing melaleuca woodland and forests is also saltwater couch and this does not representahigh fire hazard. However, in many areas Guinea grass and other exotic grasses have invaded and these can accumulate high fuel loads that pose a fire risk in the dry season. Guinea grass and many other exotic grasses tend to quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season. The most effective long-term fire hazard reduction strategy is to remove these grasses using herbicide such as glyphosate.

Production

Because of high salt levels in the soil, weed infestations are rarely a problem in saltwater couch grasslands and burning for weed control does not need to be undertaken. Saltwater couch is a perennial grass and pasture condition is strongly dependant on normal tidal cycles. Fire does not improve productivity and indeed, fire can lead to loss of important nutrients. Saltmarsh and saltwater couch grasslands are an important food source, and refuge for juvenile fish. There is strong evidence that juvenile fish feed heavily in these areas on high tides. A decrease in biomass through removal by fire, or overgrazing, may have a significant impact on coastal fisheries production.

Conservation

Apart from their values to coastal fisheries, mangroves, saltmarsh and saltwater couch grasslands provide essential habitat for a range of conservation dependant species. Minimising fire and other disturbance within these areas provides significant positive benefits for migratory and resident shorebirds, seabirds and the threatened mangrove mouse.

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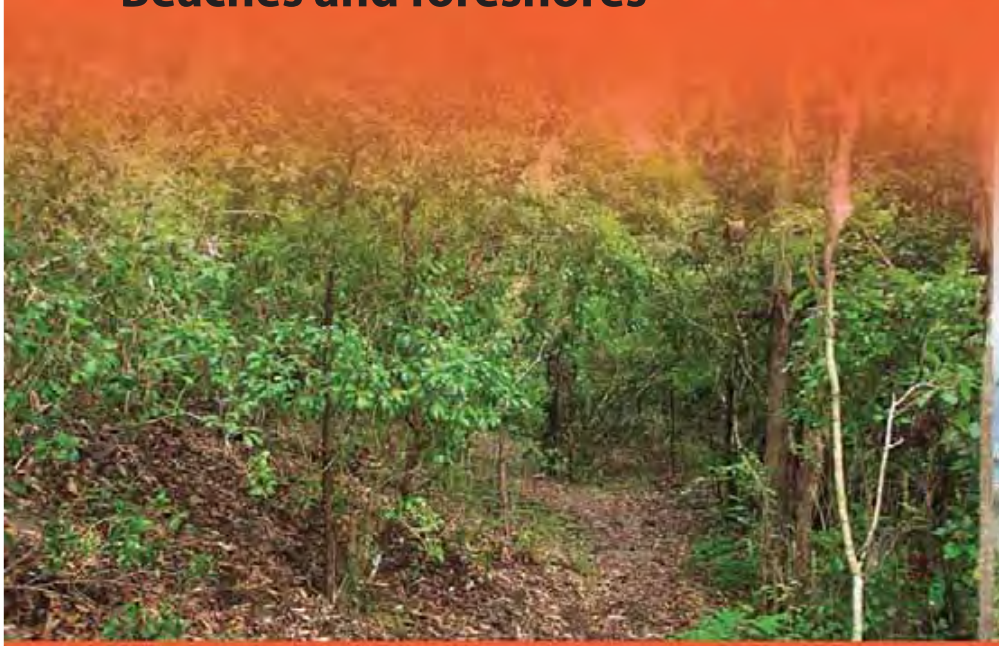
2

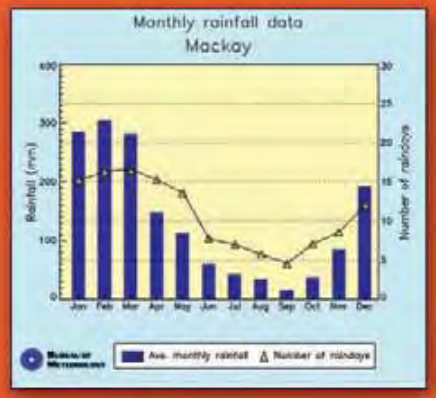
Beaches and foreshores

Landscape 2



THIS LANDSCAPE IS EXTREMELY FIRE SENSITIVE - NO BURNING

Coastal she-oak & beach scrub (rainforest) in protected areas.



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Hazard Reduction

Coast she-oak and beach scrub habitats are fire sensitive and will be killed or severely degraded by even low intensity fire.

The native ground cover within beach scrubs and coastal foreshores does not accumulate large amounts of fuel and does not represent a high fire hazard. However, infestations of exotic grasses and weeds can significantly increase hazardous fuels, especially along disturbed edges of this landscape.

Hazard reduction burning is generally not suitable in coastal areas as Guinea grass and other fire loving grasses quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season.

An effective long-term strategy is the use of registered herbicide to reduce fuel hazards where required. Apply when grasses are actively growing, preferably prior to dry season. .

Production

Many remaining areas of beach scrub are islands in a sea of cleared land, and much remaining foreshore vegetation is the only buffer between the land and the sea.

Undisturbed foreshores and beach scrubs are fairly resistant to weed invasions, however smaller patches and disturbed areas are more prone to weed invasions and associated fire risk.

Disturbance caused by stock trampling and the presence of feral pigs can encourage spread of lantana and other weeds into otherwise intact areas. Management of stock access and provision of shade and watering points away from beach scrub and foreshores will reduce the impacts of disturbance in the long term.

Reducing weed impacts by means other than fire around buffers and in degraded areas will protect, and facilitate recovery of, these sensitive coastal areas.

Conservation

Fire is a key threat to remaining areas of beach scrub (rainforest on sand dunes) - a critically endangered ecological community under the National Environment Protection and Biodiversity Conservation Act (1999). Beach scrubs and foreshores are key habitats for many rare and threatened plants and animals and migratory birds. Foreshores are breeding sites for marine turtles and shorebirds such as the beach stone- curlew (pictured above).

Disturbance of these habitats, commonly due to arson; clearing/mowing of undergrowth; stock trampling; 4WD and pedestrian tracks, leads to weed invasions and increased fire risk. Weed management, rather than fire management, should be used to protect and rehabilitate remaining areas.

Very careful use of fire in adjacent fire prone landscapes is required; check that these is little to no scorch into beach scrubs and foreshores as an indicator of successful fire management.

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Wetlands associated with sand dune systems

Landscape 4

Mixed vegetation on hind dunes (behind main beach and foreshore areas) including; Moreton Bay ash, acacia, coastal banksia, paperbarks, bloodwoods, black she-oak, peppermint and stringy barks & grasslands on sand dunes

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Hazard Reduction

Melaleuca swamps in their natural state are relatively fire tolerant due to high moisture levels in the soils and low rates of litter accumulation. They can also act as a natural fire break in the landscape.

Disturbed or degraded Melaleuca swamps may contain exotic grasses and weeds around the fringes and where water flow has been altered, ponded pasture grasses can dominate wetter areas. Guinea grass, olive hymenachne and para grass can fuel intense damaging fires.

Burning for weed control and property protection needs to be carefully managed. Protection zones should not be burnt more than once every 4-6 years. Fire can reduce para grass and hymenachne weed infestations temporarily but it is essential to burn whilst moist to reduce intensity and risk of canopy tree death. Planned burns are generally best prior to the dry season when soil moisture is high but standing water is reduced.

Weed control using approved herbicide is effective post-fire or to instead of fire. Follow up management and ongoing observation is required for successful control. Indicators of success include native wetland plant abundance, canopy tree health & reduction in extent and dominance of exotic grasses.

Production

Many areas of coastal Melaleuca swamps are grazed although pasture development is limited as they may be inundated for 3-6 months of the year.

Some areas of coastal Melaleuca swamps have been modified to establish ponded pastures. These commonly include para grass or olive Hymenacne, one of the top 20 Weeds of National Significance, and can completely choke out wetlands. Heavy dry season grazing can reduce their extent and density when fire risk is the greatest. Burning to reduce infestations can be effective and is best done in conjunction with grazing to reduce fuels and damage to wetlands.

Heavy grazing pressure in Melaleuca swamps can disturb native ground layer species and lead to woody weed infestations including Devils fig and Brazilian pepper tree. Fire is generally not recommended to manage woody weeds in melaleuca swamps, approved herbicides or other methods are preferred. Burning undertaken in land adjacent to Melaleuca swamps should ensure hot fires do not scorch edges or intrude into the wetlands.

Conservation

Melaleuca swamps are dynamic ecosystems and the timing of fire and wet and dry events plays a key role in these dynamics.

Too frequent fire from adjacent cane land, grazing paddocks or weedy urban fringes will reduce ground layer diversity and kill juvenile Melaleucas. However, Melaleuca germination is enhanced by fire and occasional fires will maintain recruitment of trees into the canopy.

To maintain the integrity of melaleuca wetlands, a fire every 10 years or more is recommended. Burning can be undertaken more often, every 5-10 years, providing fire intensity is low to moderate and a patchy burn is achieved. Native wetland vegetation will not promote intense fires however great care needs to be taken when burning exotic grasses to ensure fire does not damage or kill canopy and habitat (hollow bearing) trees. Fire retardants should not be used as they damage the ecology of these sensitive areas.

Varying the season, intensity and frequency of planned burning promotes diversity and a range of different vegetation ages.

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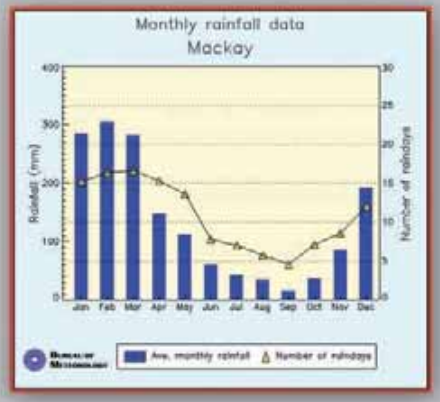
Riverine and wetlands

Landscape 5

Melaleuca (Paperbark), River Oak and lowland rainforest fringing forests along creek-lines; freshwater wetlands and sedgelands.



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Hazard Reduction

Burning is not generally recommended in vegetation fringing watercourses unless for specific management outcomes.

Riparian vegetation can act as a fire break in a wildfire and will be more effective if weeds and grasses do not dominate. Disturbance by fire and other means (eg machinery or stock trampling) encourages weed infestations and increased risk of fire. Common exotic grasses include Guinea grass and Elephant grass and these can rapidly regrow accumulating very hazardous fuel loads after fire.

Riparian and wetland vegetation is fire sensitive and damage can result from even low intensity fires. Burning is sometimes used to gain initial control over weed infestations. If used, fire should not be allowed to burn into vegetation, rather ignite along the edges as a backing fire will reduce the risk of harming fringing vegetation. Burn with good soil moisture to retain groundcover and do not burn more than once every 3-5 years.
Riparian and wetland vegetation may require active protection from wildfire in the dry season by slashing or grazing along edges. Approved herbicide can effectively reduce grassy fuel loads when applied soon after the wet season and kills effectively post-fire.

Production

Fencing off creek lines and wetlands and providing off-stream watering points protects creek banks and reduces erosion. However seasonal pulse grazing can be useful to reduce grassy fuel hazards and gain access for weed control.

Ponded pasture grasses represent the greatest threat to freshwater habitats as they can completely choke out waterways, even when being grazed. hymenachne, one of the top 20 Weeds of National Significance, and para grass can build up very large fuel loads and severely damage riparian vegetation if burnt in the dry season.
Heavy late dry season grazing of ponded pastures reduces the risk of intense fire and is useful prior to wet season flooding when grazed patches can drown. Fire has been used to gain some control of these grasses however great care needs to be taken to reduce intensity of fires to protect fringing vegetation. Burn only when fuels are moist and check scorching of fringing canopy trees as an indicator of success.

Herbicide approved for use in and around waterways, such as glyphosate without wetting agents, is effective at killing weeds including ponded pasture grasses, Guinea grass and lantana.

As with all weed control programs, follow-up is essential and ongoing monitoring is needed to ensure infestations remain under control.

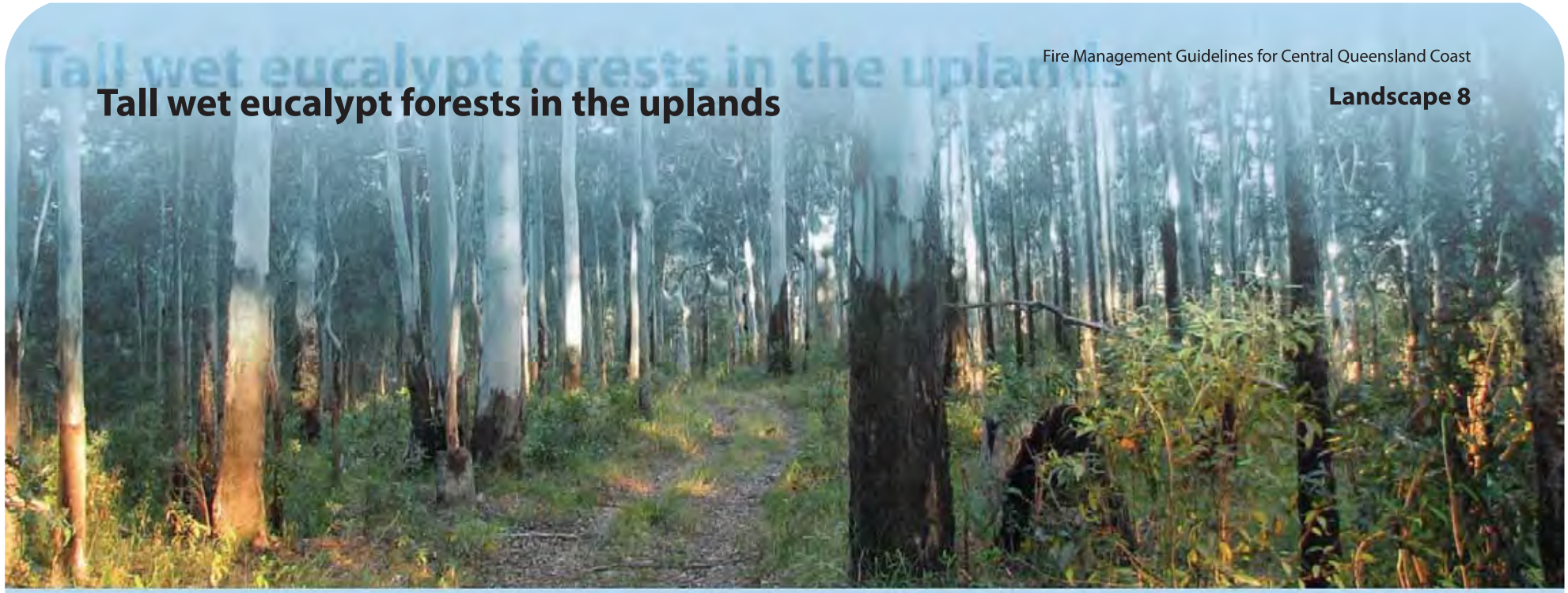
Conservation

Clearing of vegetation fringing wetlands and water courses has been extensive and most remaining areas are heavily impacted by weeds. Weed management rather than fire management will assist in maintaining or rehabilitating these areas.
Riparian and wetland vegetation provides many services including protection against soil erosion, maintenance of aquatic habitats and fishery stocks, habitat for many migratory birds and conservation dependant species such as the rufous owl. Reducing disturbance of creek-side and wetland edges and adjacent buffers is important to prevent the spread of weeds. Common disturbance includes feral pigs, uncontrolled or heavy grazing pressure, regular or intense fire and damage by machinery.

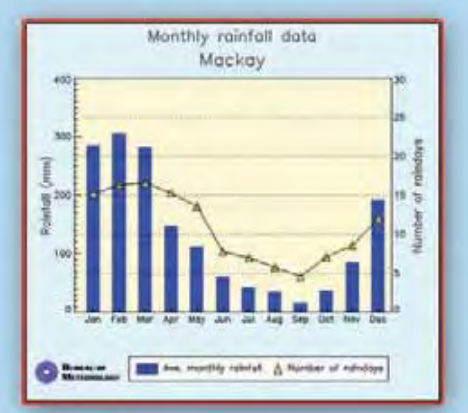
Well planned burns in surrounding fire prone vegetation can help protect riparian vegetation from hot damaging fires. Indicator of success - check for scorching on trees from surrounding fires.

Tall wet eucalypt forests in the uplands

Landscape 8



Tall grassy forest of flooded (rose) gum, pink bloodwood, red mahogany, New England blackbutt, sometimes with yellow stringybark, blue gum, brown bloodwood. A sub layer of black oak, banksia or rainforest species may be present. Bracken and grasses as ground layer.



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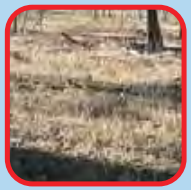
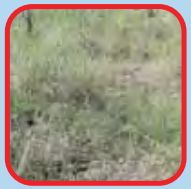
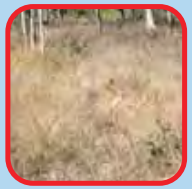


1000 kg / ha

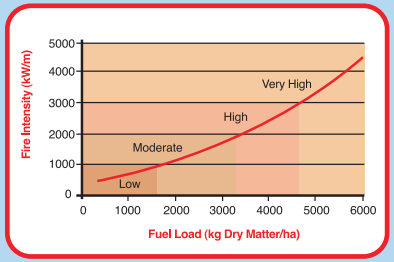
2000 kg / ha



3000 kg / ha



4000 kg / ha



Fuel Load
(kg Dry Matter/ha)

Hazard Reduction

Tall wet eucalypt forests can naturally accumulate very large fuel loads and support widespread high intensity fires.

Protection areas are best managed by regularly burning small areas with good soil moisture and managing weed impacts post-fire. Aim to burn a patch no more than once every 2-3 years with fuel loads or the disturbance will promote weed invasions.

Burning should only be undertaken when conditions are suitable - vary the season of burning to account for fuel and soil moisture levels and avoid burning when conditions are very dry as the fire risk is extreme. Later season fires are acceptable in this landscape as vegetation can take longer to dry out than surrounding woodlands. Traditional burning coincides with the first storms as follow up rain is likely allowing groundcover to quickly recover.

Areas long unburnt, dense lantana and rank grasses can carry intense fires. Burning lantana after frost has defoliated plants can result in a better kill rate.

Reducing weedy fuel hazards with approved herbicide is often a good option either before or after fire.

Production

For grazing areas, burn every 3-5 years when conditions are suitable to maintain pasture condition. Country responds rapidly when there is sufficient soil moisture. Burning a few days after rain towards the onset of the wet season is recommended; avoid mid-late dry season burning to maintain productive groundcover.

Fire exclusion, overgrazing or regular low intensity burning can result in loss of grassy ground layer. Fuel loads of 2000 kg/ha or more is recommended for promoting green pick in native pastures.

Spelling country and/or increasing time between fires will allow sufficient fuels to accumulate to carry moderate intensity fires. Burning to maintain woody vegetation structure generally requires fuel loads of 2000-3000 kg/ha; whilst reducing dense woody regrowth may require between 2500- 4000 kg/ha.

Vary fire regimes to prevent a simplified forest structure. In areas more frequently burnt, ensure there is some recruitment of canopy trees. Rainforest regrowth can be controlled by fire but this may be difficult once trees reach 2m or more, fire is still useful in these areas for maintaining a grassy layer.

Conservation

Less frequent burning of these forests over the past 100 years has resulted in dense thickening of trees and shrubs in many areas. A dense rainforest understorey may develop over a 15-17 year period to the point that the forest will not burn unless in extreme conditions.

Where areas of grassy understorey remain, a moderate intensity patchy burn every 3-5 years is recommended.

Vary fire regimes to maintain a mosaic of understorey types to mimic natural conditions. Where practical, plan for an occasional hot fire ñ storm burning is recommended to reduce risk of escape into the surrounding landscape.

Aim to protect mature hollow bearing trees as yellow-bellied gliders, powerful owls and glossy black cockatoos are largely dependant on these habitats. Intense dry season fires are the key threats to these habitats. Protect adjacent rainforest edges from impacts of hot fire. Carefully planned mosaic patch burning in adjacent woodlands may reduce severity and extent of wildfire by breaking up fire front.

RE 8.1.1 can clearly be distinguished by its dominance of mangrove tree and shrub species. It is well established in the tidal flats of St Helens Bay and dominates the northern section of the foreshore around Carpet Snake Island and the headland. The mangrove communities in the St Helens Beach coastal unit are exposed to vehicle and boat access, marine debris, disturbance due to alteration of adjacent ecosystems (e.g. residential development) and stormwater runoff. While offshore vegetation is not within council land tenure, it is important to recognise that onshore activities influence marine ecosystems, including mangroves, salt flats and seagrasses. Appropriate management of recreational access and improved stormwater management practices will assist in protecting these offshore ecosystems. Mangroves are highly fire sensitive and therefore can be put at risk when flammable vegetation such as woodlands and forests of *Melaleuca* spp. or areas with grassy weed infestations are present in adjacent areas. Generally, this ecosystem is resilient to weed incursion due to its saline growing conditions however lantana (*Lantana camara*) occasionally encroaches in less saline areas. Fire Management Guidelines for Regional Ecosystems within the St Helens Beach Coastal unit area can be found within the Clarke Connors Ranges Fire Management Guidelines (Reef Catchments 2009).

RE 8.2.1 describes *Casuarina equisetifolia* woodland and/or sparse herbland to open scrub on foredunes and beaches. It can be distinguished from all other regional ecosystems as it is predominantly distributed along the foredunes and typically comprise of species such as coastal sheoak (*Casuarina equisetifolia* subsp. *Incana*) and ground cover species such as beach spinifex (*Spinifex sericeus*), beach bean (*Canavalia rosea*), goats foot (*Ipomoea pes-caprae*) and birds beak grass (*Thuarea involuta*). Common species in the canopy or lower tree and shrub layers include: tulip tree (*Thespesia populnea*), silver bean (*Sophora tomentosa*), beach pandan (*Pandanus tectorius*), beach hibiscus (*Hibiscus tiliaceus*), soap tree (*Alphitonia excelsa*), flintwood (*Geijera salicifolia*) and gray nicker nut (*Caesalpinia bonduc*). Shrub layers often include: coastal vitex (*Vitex trifolia*), coastal lollybush (*Clerodendrum inerme*), tuckeroo (*Clerodendrum anacardioides*), forest indigo (*Indigofera pratensis*), beach berry bush (*Colubrina asiatica*), and octopus bush (*Argusia argentea*). Vegetation within this community is usually zoned according to tidal inundation/ exposure with the herbaceous communities closest to the sea and the open forest to woodland communities furthest landward. At St Helens Beach, the only occurrence of this vegetation type is located within State managed land between Zones C and D where it co-colonises the area with RE 8.2.6. Disturbance caused by nearby developments has caused invasion by weed species. Species within this RE are fire sensitive and the removal of ground layer vegetation often results in infestation of pest species such as Guinea grass (*Megathyrsus maximus*) and other weed species, which can intensify fire risk.

RE 8.2.6 describes Moreton bay ash (*Corymbia tessellaris*) open forest to low woodland. *Acacia leptocarpa* and/ or *Allocasuarina littoralis* and/or *Banksia integrifolia* are occasionally present as a codominant canopy tree. This vegetation community is found only on open forest on parallel dunes, and within the coastal unit it is found at the northern and western edges of Murray Road in Zone D where it co-colonises the area with RE 8.2.1. Dune forests are naturally restricted communities which are vulnerable to erosion and weed invasion, and a large proportion of the area mapped is in moderate to poor condition due to these factors. RE 8.2.6 is threatened locally by weed species and inappropriate fire regimes. The Clark Connors Range bushfire consortium (Reef Catchments 2009) does not support burning of beach ridge communities that have a component of littoral vine forest, instead it proposes that burns take place within adjacent fire adapted ecosystems under conditions where fire do not penetrate beach ridge communities. Infestations of exotic grass such as Guinea grass need to be addressed immediately as they increase fire risk.

RE 8.12.20a describes *Eucalyptus platyphylla* and/or *Eucalyptus drepanophylla* woodland to open forest. RE 8.12.20a occurs on low gently undulating landscapes, such as the landward regions of Midge Point. This vegetation is often in a poor to moderate condition. Problem weeds include lantana (*Lantana camara*), sensitive weed (*Mimosa pudica*), American rats tail grass (*Sporobolus jacquemontii*) (and other introduced *Sporobolus* spp.), Chinese burr (*Triumfetta rhomboidea*), snakeweed (*Stachytarpheta jamaicensis*), corky passionflower (*Passiflora suberosa*), grader grass (*Themeda quadrivalvis*) and many others. Weed invasion, grazing by horses and cattle further diminish the health of this ecosystem. At least 30% of this RE should remain unburnt in any given area and emphasis should be placed on the general principles of mosaic burning and diversity of fire types.

APPENDIX 3: Coastal revegetation principles

Encouraging the natural regeneration of native species is the best method for restoration of an area. For this to occur a viable seed bank must be present, and re-growth must include all native plant species from each stratum level. In areas where natural regeneration is to occur, the area should be clearly marked to exclude public access. In these areas, ongoing maintenance is required to minimise re-growth of weed species. However, the planting of local native vegetation (revegetation) is sometimes required due to insufficient cover or regrowth of native species.

Revegetation techniques

Revegetation in natural areas aims to reinstate Regional Ecosystems communities as described by Queensland Herbarium (Regional Ecosystem Description Database). In disturbed areas, pre-clearing mapping is available to inform what Regional Ecosystems were present prior to vegetation clearing.

Suggested techniques for coastal revegetation in the Mackay Regional Council area include:

- Local native species for planting should be sourced from within the Sarina Proserpine lowlands Subregion of the Central Queensland Coast Bioregion.
- Site preparation, such as weed control, should be carried out prior to planting.
- Depending on the site-specific circumstances coastal plantings may benefit from the use of mulch, weed mats, stakes, and/or tree guards.
- Tubestock planted in sandy soils will benefit from the addition of a wetting agent and fertiliser at the time of planting.
- Ongoing maintenance of the site is required.

Consideration of fire risk

State Planning Policy 1/03 under the Sustainable Planning Act 2009 deals with the mitigation of adverse impacts of bushfire, and includes a natural hazard assessment for bushfires and the subsequent provision of safety buffers. According to this policy, a low hazard score and no prescribed safety buffer width is allocated to “narrow strips of coastal vegetation with a linear shape, less than 50 hectares in area and more than one kilometre from the nearest extensive vegetation, on 0-5% slope, with an eastern aspect” (Queensland Government, 2003).

All revegetation activities undertaken as part of coastal projects will be done so with consideration of this State Planning Policy. Designated space for fire breaks and emergency vehicle access will be provided between freehold properties and natural environment areas being revegetated, as per Mackay Regional Council Coastal Management Guidelines (2012).

Selecting plants for revegetation

The table below provides a generic list of recommended species for dune revegetation in the Mackay region, compiled from characteristic species of relevant Regional Ecosystems (8.1.1 8.1.2, 8.2.1, 8.2.2, 8.2.6a and 8.2.9a), various coastal species lists from Subregion 2, revegetation recommendations, and field observations. The species selected for revegetation at any particular location will ultimately depend on current and preclearing Regional Ecosystem mapping, and site-specific conditions (such as aspect, topography, existing vegetation, soil condition, availability of appropriate plants, etc.).

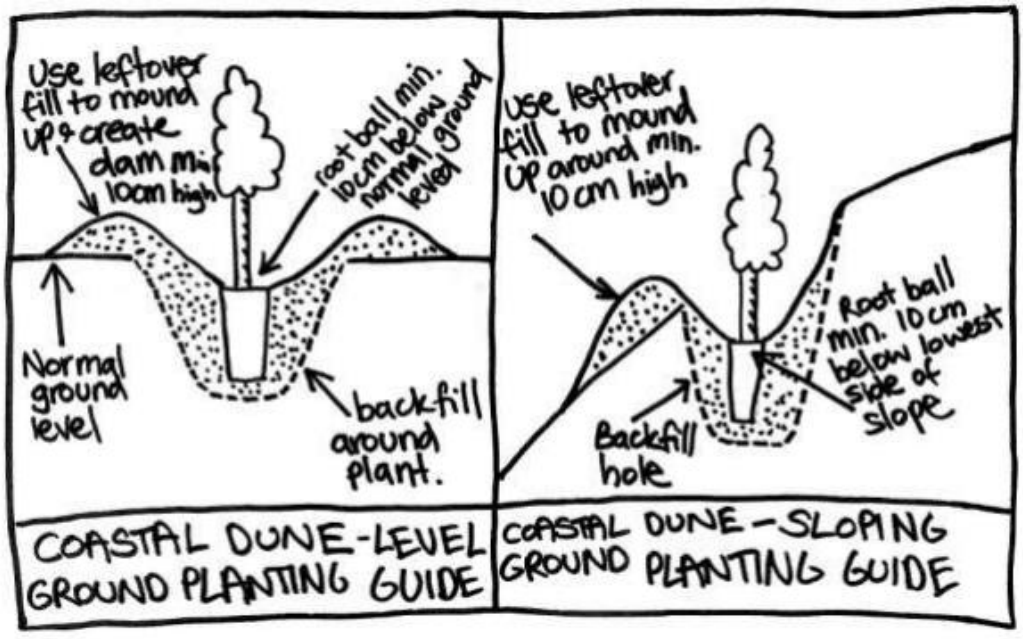


Figure 1: *Coastal dune planting guide*

Appendix 4*: Generic list of recommended species for coastal revegetation in the Mackay Region

*Local experts will be consulted for specific advice regarding unique vegetation communities, where appropriate.

Species name	Common name	Habit	Regional Ecosystem
Acacia leptocarpa	north coast wattle, slender fruited wattle	Tree	8.2.6
Acacia oraria	coast wattle	Tree	8.2.2; 8.2.6
Acronychia laevis	hard aspen, glossy acronychia, yellow wood	Tree	8.2.2
Alphitonia excelsa	red ash, soapy ash	Tree	8.2.1; 8.2.6
Argusia argentea	octopus bush	Tree	8.2.1
Banksia integrifolia subsp. compar	coastal banksia	Tree	8.2.6
Calophyllum inophyllum	beauty leaf, beach calophyllum, ball nut	Tree	8.2.1
Canavalia rosea	beach bean	Groundcover	8.2.1
Capparis lucida	coastal caper	Tree	8.2.1; 8.2.2
Casuarina equistifolia	coastal she oak	Tree	8.2.1
Chionanthus ramiflorus	native olive	Tree	8.2.2; 8.2.6
Clerodendrum floribundum	lolly bush	Tree	8.2.2; 8.2.6
Clerodendrum inerme	coastal lollybush	Shrub	8.2.1
Corymbia tessellaris	Morton Bay ash	Tree	8.2.6
Crinum pendunculatum	river lily, swamp lily	Herb	8.2.1
Crotalaria mitchellii	sand rattlepod	Herb	8.2.9
Cupaniopsis anacardioides	tuckeroo	Tree	8.2.1; 8.2.2; 8.2.6
Cymbopogon refractus	barbed wire grass	Grass	8.2.9
Cyperus pedunculatus	pineapple sedge	Sedge	8.2.1; 8.2.9
Dianella caerulea	blue flax lily	Herb	8.2.6; 8.2.9
Dianella longifolia	smooth flax lily	Herb	8.2.6a; 8.2.9
Diospyros geminata	scaly ebony	Tree	8.2.2; 8.2.6
Dodeonaea viscosa subsp.viscosa	sticky hop bush	Shrub	8.2.1
Drypetes deplanchei	yellow tulip	Tree	8.2.2
Eragrostis interrupta	coastal love grass	Grass	8.2.6; 8.2.9
Eriachne triodioides	wanderrie grass	Grass	8.2.6; 8.2.9
Eugenia reinwardtiana	beach cherry	Shrub	8.2.2
Euroschinus falcatus	ribbonwood	Tree	8.2.2; 8.2.6
Eustrephus latifolius	wombat berry	Climber	8.2.2; 8.2.6
Ganophyllum falcatum	scaly ash	Tree	8.2.2; 8.2.6
Geitonoplesium cymosum	scrambling lily	Climber	8.2.2; 8.2.6
Heteropogon triticeus	giant spear grass	Grass	8.2.2; 8.2.9
Hibbertia scandens	golden Guinea flower, snake vine	Climber/groundcover	8.2.1
Hibiscus heterophyllus	native hibiscus	Shrub	8.2.6
Imperata cylindrica	blady grass	Grass	8.2.6; 8.2.9
Ipomoea pes-caprae	goats foot convolvulus	Groundcover	8.2.1
Jagera pseudorhus	foam bark	Tree	8.2.6
Jasminum didymium	native jasmine	Climber/Shrub	8.2.2; 8.2.6
Lomandra longifolia	spiny-headed mat-rush	Herb	8.2.6
Macaranga tanarius	macaranga	Tree	8.2.2; 8.2.6
Mallotus philippensis	red kamala	Tree	8.2.2; 8.2.6

Appendix 4*: Generic list of recommended species for coastal revegetation in the Mackay Region

Species name	Common name	Habit	Regional Ecosystem
Melia azedarach	white cedar	Tree	8.2.6
Mimusops elengi	red coondoo	Tree	8.2.2
Morinda citrifolia	giant morinda, cheese fruit, smelly cheese tree	Tree	8.2.1
Pandanus tectorius	beach pandan, coastal screw, pine pandanus	Tree	8.2.1; 8.2.6
Pittosporum ferrugineum	rusty pittospporum	Tree	8.2.1; 8.2.6
Planchonia careya	cocky apple	Tree	8.2.6
Pleiogynium timorense	Burdekin plum	Tree	8.2.2; 8.2.6
Scaevola taccada	sea lettuce	Shrub	8.2.1
Sophora tomentosa	silver bean	Shrub	8.2.1
Spinifex sericeus	beach spinifex	Grass	8.2.1
Sporobolus virginicus	marine couch	Groundcover	8.2.1
Stephania japonica	tape vine	Climber/groundcover	8.2.1; 8.2.2; 8.2.6
Sterculia quadrifida	peanut tree	Tree	8.2.2; 8.2.6
Terminalia muelleri	coast damson	Tree	8.2.1; 8.2.2; 8.2.6
Themeda triandra	kangaroo grass	Grass	8.2.6; 8.2.9
Thespesia populnea	tulip tree	Tree	8.2.1
Thuarea involuta	birds beak grass	Grass	8.2.1
Vigna marina	vigna	Groundcover	8.2.1
Vitex rotundifolia	creeping vitex, beach vitex	Groundcover	8.2.1
Vitex trifolia	coastal vitex, common blue vitex	Shrub	8.2.1
Xerochrysum bracteatum	golden everlasting daisy	Herb	8.2.9

View sensitive native plant list

Species name	Common name	Habit	Regional Ecosystem
Acacia simsii	Sim's wattle	Shrub	8.2.6
Caesalpinia bonduc	nicker nut	Climber	8.2.1
Canavalia rosea	beach bean	Groundcover	8.2.1
Clerodendrum inerme	coastal lollybush	Shrub	8.2.1
Crinum pedunculatum	river lily, swamp lily	Tufty	8.2.1
Crotalaria mitchellii	sand rattlepod	Herb	8.2.9
Cymbopogon refractus	barbed wire grass	Grass	8.2.9
Cyperus pedunculatus	pineapple sedge	Sedge	8.2.1; 8.2.9
Dianella caerulea	blue flax lily	Herb	8.2.6; 8.2.9
Dianella longifolia	smooth flax lily	Herb	8.2.6a; 8.2.9
Dodonaea viscosa subsp. viscosa	sticky hop bush	Shrub	8.2.1
Eragrostis interrupta	coastal love grass	Grass	8.2.6; 8.2.9
Eriachne triodioides	wanderrie grass	Grass	8.2.6; 8.2.9
Eustrephus latifolius	wombat berry	Climber	8.2.2; 8.2.6
Geitonoplesium cymosum	scrambling lily	Climber	8.2.2; 8.2.6

Appendix 4*: Generic list of recommended species for coastal revegetation in the Mackay Region

Species name	Common name	Habit	Regional Ecosystem
Heteropogon triticeus	giant spear grass	Grass	8.2.6; 8.2.9
Hibbertia scandens	golden Guinea flower, snake vine	Climber/groundcover	8.2.1
Imperata cylindrica	blady grass	Grass	8.2.6; 8.2.9
Ipomoea pes-caprae	goats foot convolvulus	Groundcover	8.2.1
Jasminum didymium	native jasmine	Climber/shrub	8.2.2; 8.2.6
Lomandra longifolia	spiny-headed mat-rush	Herb	8.2.6
Scaevola taccada	sea lettuce	Shrub	8.2.1
Sophora tomentosa	silver bean	Shrub	8.2.1
Spinifex sericeus	beach spinifex	Grass	8.2.1
Sporobolus virginicus	marine couch	Groundcover	8.2.1
Stephania japonica	tape vine	Climber/groundcover	8.2.1; 8.2.2; 8.2.6
Themeda triandra	kangaroo grass	Grass	8.2.6; 8.2.9
Thuarea involuta	birds beak grass	Grass	8.2.1
Vigna marina	vigna	Groundcover	8.2.1
Vitex rotundifolia	creeping vitex, beach vitex	Groundcover	8.2.1
Vitex trifolia	coastal vitex, common blue vitex	Shrub	8.2.1
Xerochrysum bracteatum	golden everlasting daisy	Herb	8.2.9

Appendix 5: Weed control principles

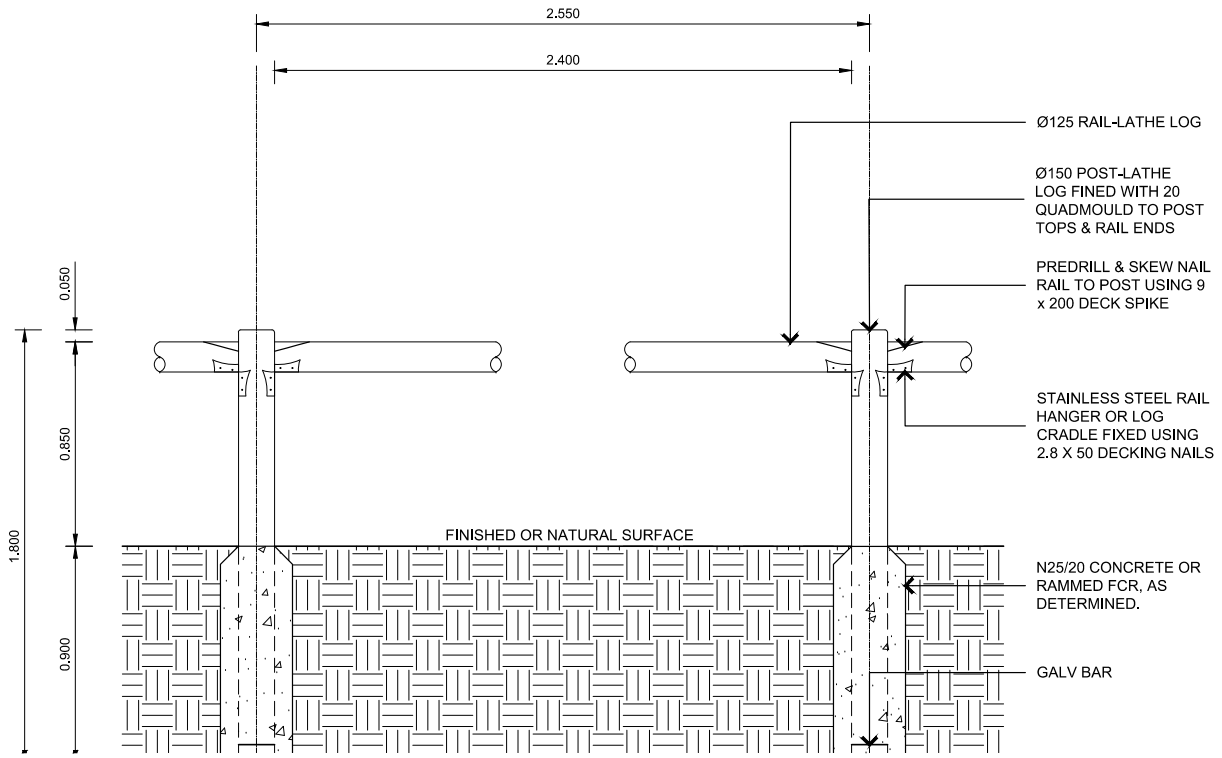
Principles	Comments
Staged weed removal	• Weed removal should be carried out in a staged approach. • Work outwards from intact remnants of coastal vegetation as a priority. • Particularly important in removal of non-native vegetation along the dune scarp. • Large woody weeds should be removed slowly to ensure the replaced native vegetation provides sufficient habitat value and protection against erosion before more removal of woody species.
Physical weed removal	• Physical weed removal, including hand pulling, chipping or cutting weeds is effective in small infestations in environmentally sensitive areas.
Mechanical weed removal	• Mowing or brush cutting will suppress weed growth, discourage seeding and spread. • This method should be used particularly in areas bordering large infestations. • Care should be taken to reduce potential disturbance as excessive mowing and brush cutting can facilitate further weed growth and reduce regeneration of native vegetation.
Herbicide weed removal	• The application of herbicides includes foliage or basal spraying, cut/ paste and stem injection where applicable. • Spraying may be carried out on large or robust weed infestation, particularly to gain initial control of an infestation. However the majority of spraying is likely to be small scale 'spot spray' applications to minimise non-target impacts. • Roundup Bi-active ® is recommended due to its low toxicity to wildlife and humans.
Timing	• Weed control on foredunes to occur between April and October only, to avoid turtle nesting season (November to March). • Weed control on hind dunes can occur at any time of the year depending on local weather conditions. Herbicide application is ineffective if carried out during rain periods, or once the plants have entered their non-active period during extended dry periods.
Consideration of fire risk	• Once treated, remaining dead woody weeds (such as Lantana) should be pulled away from native trees to reduce the fire risk to fire-sensitive coastal vegetation should 'accidental' fires occur. This woody, dry biomass serves as fuel for fires and by pulling it away from native trees it reduces the chances of fire reaching the canopy. • Mulching down of large, dense areas of dead woody weeds using brush cutters or hand tools, would similarly reduce fire risk and allow native plants a better chance at regeneration.
Preventing re-infestations	• Keep maintenance vehicles on the existing tracks where possible to reduce disturbance. • Clean maintenance vehicles before and after access to the site to prevent weed spread or introduction. • Monitor the success of weed control techniques and native regeneration following several wet seasons to assess whether revegetation might be needed in large areas of infestation.

Appendix 6: Main weed species found in coastal areas in the Mackay region

Species Name	Common Name	Form
Agave sp.	sisal hemp	Succulent
Ageratum conyzoides subsp. conyzoides	billy goat weed	Herb
Alternanthera brasiliana	red-leaved alternanthera	Herb
Antigonon leptopus	coral vine	Climber
Aster subulatus	wild aster, bushy starwort	Herb
Bidens alba var. radiata	cobbler's peg	Herb
Bougainvillea sp	bougainvillea	Vine
Bryophyllum sp.	mother-of-millions	Shrub
Bryophyllum delagonenses	mother-of-millions hybrid	Shrub
Callisia fragrans	callisia	Herb
Catharanthus roseus	pink periwinkle	Herb
Cenchrus echinatus	Seaforth burr	Grass
Cocus nucifera	coconut palm	Tree
Conyza canadensis var. pusilla	fleabane	Herb
Corymbia torelliana	cadagi	Ree
Crotalaria pallida	rattlepod	Herb
Dactyloctenium sp.	button grass	Grass
Delonix regia	poinciana	Tree
Dichantium annulatum	sheda grass	Grass
Digitaria didactyla	blue couch	Grass
Duranta erecta	duranta	Shrub
Eleusine indica	crowsfoot grass	Grass
Emilia sonchifolia	emelia	Herb
Euphorbia cyathophora	painted spurge	Herb
Hyparrhenia rufa	thatch grass	Grass
Ipomoea indica	coastal morning glory	Herb
Lantana camara	lantana	Shrub or branched climber
Leucaena leucocephala	leucaena	Small tree
Macroptilium atropurpureum	siratro	Vine
Megathyrsus maximus	Guinea grass	Grass
Melinus repens	red natal grass	Grass
Melinis minutiflora	molasses grass	Grass
Mimosa pudica	sensitive weed	Herb
Momordica charantia	balsam pear	Vine
Oenothera drummondii subsp. drummondii	beach evening primrose	Herb
Opuntia stricta	common prickly pear	Succulent
Opuntia monacantha	drooping prickly pear	Succulent
Passiflora foetida	stinking passionfruit	Climber
Passiflora suberosa	corky passionfruit	Climber
Persicaria perfoliata	mile-a-minute	Vine
Psidium guajava	guava	Small tree
Portulaca pilosa	hairy pigweed	Succulent
Ricinus communis	castor oil plant	Sub-shrub
Richardia brasiliensis	Mexican clover	Herb
Salsola australis	prickly starwort	Succulent shrub

Appendix 6: Main weed species found in coastal areas in the Mackay region

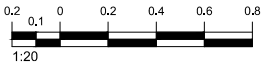
Species Name	Common Name	Form
Sansevieria trifasciata	mother-in-laws tounge	Herb
Senna pendula var. glabrata	Easter cassia	Shrub or branched climber
Sida cordifolia	sida	Sub-shrub
Solanum capsicoides	devil's apple	Sub-shrub
Solanum chrysotrichum	devil's fig	Sub-shrub
Solanum nigrum	black nightshade	Sub-shrub
Solanum seaforthianum	Brazilian nightshade	Sub-shrub
Sphagneticola trilobata	Singapore daisy	Groundcover
Stachytarpheta jamaicensis	snake weed	Herb or sub-shrub
Stylosanthes humilis	stylo	Herb
Themeda quadrivalvis	grader grass	Grass
Tradescantia spathacea	Moses-in-a-cradle	Herb
Tridax procumbens	tridax daisy	Herb
Triumfetta rhomboidea	Chinese burr	Sub-shrub
Urochloa decumbens	signal grass	Grass
Yucca aloifolia	yucca	Succulent



POST & RAIL DETAIL FOR THE BEACH ENVIRONMENT
1:20

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. CONCRETE STRENGTH: N25/10.
3. ALL TIMBER SHALL BE H4 'TANALITH E' TREATED PINE LATHE LOGS IN ACCORDANCE WITH AS/NZ 1604.1:2000, OR APPROVED SIMILAR.
4. ALL STEEL COMPONENTS & FASTENERS TO BE HOT DIPPED GALVANISED MIN. COATING THICKNESS AS PER AS/NZ1214 AND AS.NZ 4680 UNLESS NOTED OTHERWISE.
5. FOR POST AND RAIL INSTALLATION WITHIN A BEACH ENVIRONMENT, THE MASS CONCRETE FOOTING IS TO BE DELETED AND THE POST EXTENDED INTO THE GROUND A MIN.900mm DEEP. BACKFILL AND COMPACT GRADUALLY WITH EXCAVATED SOIL.
6. ALL FOOTINGS BE TO INSTALLED CLEAR OF ANY W&S ASSETS.



C	22.02.17	REVISED FORMAT	
B	13.11.06	REDUCED POST SPACINGS	
A		ORIGINAL ISSUE	
	DATE	DESCRIPTION	APPVD

AMENDMENTS AND REVISIONS
\STANDARD DRAWING\PARKS & GARDENS

SURVEY
SURVEY FILE No
LEVEL DATUM
MERIDIAN

DRAWN	D A	SIGNED D ANDREWS	DATE 13.11.06
DESIGNED	D A	SIGNED D ANDREWS	DATE 13.11.06
CHECKED	J C	SIGNED J CLARK	DATE 13.11.06

EXECUTIVE MANAGER
ORIGINAL SIGNED BY STUART HOLLEY — 13.11.06 DATE

DIRECTOR ENGINEERING AND COMMERCIAL INFRASTRUCTURE
ORIGINAL SIGNED BY S. M. HOLLEY
STUART HOLLEY
DATE 13.11.06

Mackay REGIONAL COUNCIL

STANDARD
POST & RAIL DETAIL
BEACH ENVIRONMENT

SHEET 1 OF 1
WORKS JOB No.
DRAWING No. A3-00160
AMEND. B

Local Coastal Plan

St Helens Beach 2020

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73 Gordon Street, Mackay

Mon-Fri
8:30am - 4:30pm

Mirani
20 Victoria Street, Mirani

Mon-Fri
8:30am - 4:30pm

Sarina
65 Broad Street, Sarina

Mon-Fri
8:30am - 4:30pm

Mackay REGIONAL COUNCIL

REEF CATCHMENTS