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SAROS





# 5.0 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 cultural and 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.

Sarina Beach is approximately 40km south of Mackay. The area is a popular place to visit for locals and tourists, boasting a suite of natural and recreational assets including barbecues, picnic facilities and playground infrastructure. The Sarina Beach coastal unit is valued by young families and domestic tourists visiting the Mackay-Sarina region. People can be seen regularly enjoying the recreational area, walking along the beach and cycling along the esplanade, as well as enjoying views of Sarina Inlet from the Perpetua Point lookout.

## 5.1 CULTURAL HERITAGE

On the 25 February 2020 the Federal Court recognised the Native Title rights and interests of the Yuwibara People across more than 313,000 hectares of land and waters around Mackay. This determination recognises their 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. The determination area includes the Sarina Beach local coastal unit (Figure 37). Council is committed to managing culturally significant places sensitively in partnership with the Yuwi people. Council acknowledges the importance of cultural heritage to the area and will work with Traditional Owners to recapture their connection to country.

It is important to facilitate the exploration of this area by Traditional Owners in order to document and preserve culturally significant locations and/or objects. In order to do so, it is recommended that the Traditional Owners through the Native Title body, the Yuwi Aboriginal Corporation, are consulted regarding any proposed activities within the determination area. It is also recommended to facilitate on-Country visits by the 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 their cultural heritage in the coastal unit and outline clear management objectives for its preservation.

## 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. Council's *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 the needs of the broader Sarina 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.

The Sarina Beach coastal unit contains a variety of public open space, including recreational parks and undeveloped esplanade (road reserve).

In addition to the two Open Space Recreational Parks in the coastal unit, there are recreational opportunities within Captain Blackwood Drive Reserve, including two boat ramps and a lookout on Perpetua Point headland. Additionally, a mobile library service (*My Library*) visits Sarina Beach at least twice a month for the community to enjoy.

Owen Jenkins Drive Park is located along Owen Jenkins Drive in the Esplanade area north of the Surf Lifesaving Club. The road reserve on Sunset Drive is split across two parcels of land on either side of Sunset Drive, between Sarina Coast Road and Captain Blackwood Drive. Brookfield Park is located further inland at the southern end of Brookfield Drive. While it is outside the scope of this *Local Coastal Plan*, there are opportunities to provide connections between this park and the other key recreational assets, through directional signage, themed landscaping and coordinated interpretive signage.





Figure 37: Native Title determination relevant to Sarina Beach.



Owen Jenkins Drive Park is located at the southern end of Zone A. In council's *Open Space Strategy* this park is categorised as a District Recreational Park, encouraging extended stay (more than 3 hours) through the provision of two sheltered seating areas, barbeques, large active play area, public toilet facilities, a drinking fountain, waste bins, signage (both regulatory and informative), and car parking (Figure 38). Though classified as a District Recreation Park, it is noted that the size of Owen Jenkins Drive Park, at 0.42ha in size, is substantially smaller than the guideline size of 1.5-3ha specified within the *Recreational Open Space Strategy*. Two official beach access points are available through Owen Jenkins Drive Park. There are plans underway to upgrade the facilities in this park so that each shelter is extended, and council is in the process of renewing and expanding the picnic and barbeque facilities. Paths and ramped access points will provide pram and disability access to the facilities. As part of the upgrade to Owen Jenkins Drive Park, council should consider viewing corridors from the sheltered picnic areas over the ocean, to increase the aesthetic and recreational value of the park for those unable to access the beach.

Along Owen Jenkins Drive, a review of safety, availability and appropriateness of car parking is suggested. Near SAR01 the car parking area is limited and not well signed. As the only area in the coastal unit with an off-leash dog walking area, this access point is popular. In addition, the community has noted that car parking around the coastal unit is not sufficient to cater for large community events such as the Surf Lifesaving carnival and car parking is therefore occurring on nearby Freehold blocks. The recommended review of car parking in this area should consider both temporary and overflow parking during events, as well as regular demand.

Captain Blackwood Drive Reserve is located on the headland at the southern tip of the coastal unit, within Zone B. The Reserve area is steep and provides a good vantage point for viewing the rocky foreshore and estuary area. There is currently a small viewing area accessible by a steep set of stairs at the top of the hill, though the local preference appears to be parking along Captain Blackwood Drive and viewing the area from the roadside. This vantage point offers expansive views of the Sarina Inlet to the south (Figure 40), the rocky foreshore to the east, and the sandy tidal flats of Sarina Beach to the north. Locals have expressed a keen interest in developing this lookout area in line with council's Regional Self-Drive Lookout Trail which is currently under development. Locals anticipate that an upgraded lookout would attract visitors to the area, which in turn would support local businesses. Council is currently conducting a feasibility study for the upgrade of this lookout. Management of vegetation at the Captain Blackwood Drive lookout may be required to maintain the view.

The recreational value of this area could be increased further by investigating other opportunities to provide connections between the Perpetua Point Lookout and the Campwin Beach Lookout such as a walking trail, which incorporates the existing 10,000 steps course. Investigating the feasibility of such connections is recommended, including consideration of all abilities access.

Zone B also contains two formal boat ramp facilities and one

informal, providing another recreational drawcard for the area and access to Sarina Inlet. The boat ramp area contains extensive and well signed car parking options and this should be considered in the review of car parking for Zone A, with respect to overflow parking options.

In Zone C, an area of public open space exists adjacent to the intersection of Sunset Drive and Sarina Beach Road. This area is currently mapped as a Local Recreation Park, which are designed to function as a short stay recreation destinations (less than 3 hours). However the land is a road reserve parcel and the area is therefore largely unsuitable for recreational infrastructure. It is recommended that council review the classification of this parcel and consider its alignment with the *Recreational Open Space Strategy*. Currently, much of the reserve is mown, with no trees or facilities except two picnic benches. The land is at the entrance to Sarina Beach, on the corner of Sarina Coast Road, just before the coastline becomes visible. There is scope to develop this space as an entrance statement with appropriate native landscaping and signage to welcome visitors to Sarina Beach and direct them to key recreational assets, such as Owen Jenkins Drive Park, the boat ramp and Perpetua Point Lookout. To increase the recreational value of this road reserve, council could consider ways to improve infrastructure that continues to facilitate passive recreational use of this area and provide a comfortable space to enjoy food from the nearby local shop, such as shading to the existing seating. Slightly outside the edge of the road reserve is the Sarina Inlet Trail, a short coastal walk enjoyed by locals. Additional interpretive signage about Sarina Inlet or native vegetation could be developed to supplement the new signage recently installed.

Zone D is also zoned as Open Space in the Planning Scheme. This area is a road reserve parcel and there are currently no recreational facilities. The community has expressed interest in utilising the area to support low-impact recreation and tourism opportunities such as walking paths, signage or seating areas. Installation of any infrastructure should consider the constraints of the location, including the remnant vegetation, tidal influence and frequent inundation of the area. It is recommended that council investigate the feasibility of facilitating low-impact recreational opportunities in Zone D.

The connectivity and cohesiveness across all parks and Open Space recreational areas should be a consideration for council in the development of these public spaces. Council may consider adopting a landscaping style or theme across all park areas which utilises native plants. Coordinated interpretive signage could also be considered across these public spaces to provide learning opportunities for locals and visitors. Landscaping styles, interpretive signage and other opportunities for cohesiveness across the parks should be discussed and workshopped with the local community.



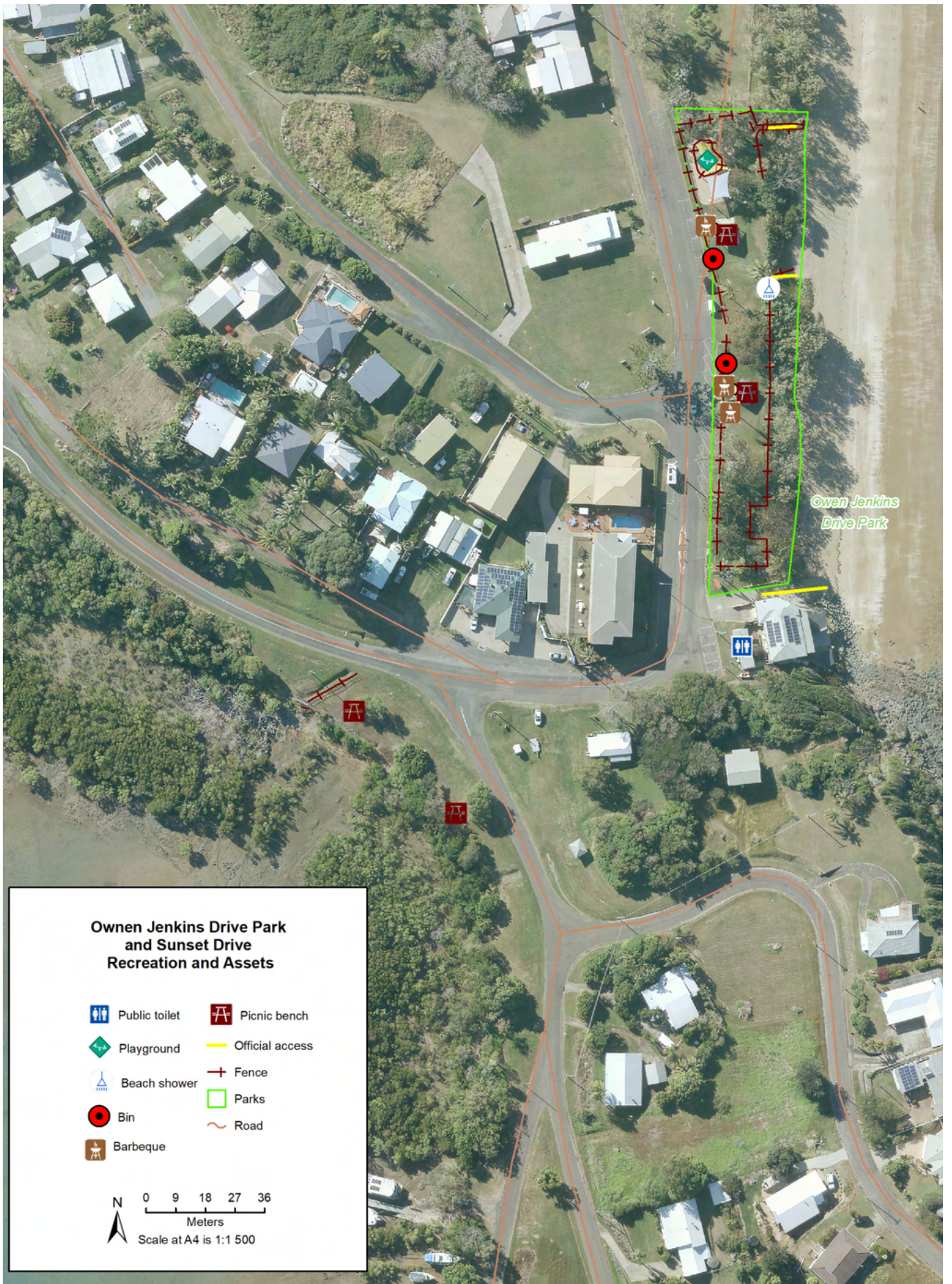


Figure 38: Owen Jenkins Drive Park and road reserve on Sunset Drive recreational assets.





**Figure 39:** *Playground within Owen Jenkins Drive Park.*



**Figure 40:** *Southward view from Perpetua Point lookout, over Sarina Inlet.*



## 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).

Residents from the Sarina Beach local coastal unit appreciate the accessibility of the beach, which is within walking distance of the majority of residential properties. Visitors and locals alike, enjoy picnicking under the shade of trees along the esplanade and in the existing parks, as well as being able to walk along both the esplanade and the beach unhindered. Locals are proud that the area is a place for recreational activities, for tourists to visit, and for the Sarina Beach Coconut Festival held each year to celebrate the recreational opportunities in the area.

Formal access to Sarina Beach is through five official access points located throughout Zone A (Figure 42). No official access points exist in Zones B or C as these foreshore areas are primarily rocky and aren't heavily utilised. Similarly, there are no access points in Zone D as the area is densely vegetated with mangroves. Development of recreational assets in Zone D would have to be accompanied by the installation of a formal access point. Post and rail fencing throughout Zone A directs pedestrians to official access points. The only unofficial access paths in Zone A are located in the northern extent of the coastal unit, adjacent to the Sarina Beach Motel. This is likely due to the absence of post and rail fencing along the shoreline in front of the Sarina Beach Motel. Visitors at the motel are encouraged to sit beachside, with lounge chairs placed on the lawn facing the beach and users walk straight from this mown esplanade area onto the beach (Figure 43). These unofficial paths facilitate the loss of native vegetation cover, encourage weed colonisation and increase localised erosion processes. Regular disturbance contributes to sand compaction and limits vegetation recruitment and should be discouraged through the installation of post and rail fencing and signage. It is recommended that an additional access point be installed close to the Sarina Beach Motel between SAR01 and SAR02, and post and rail fencing will be extended, from

Owen Jenkins park and esplanade area to the northern end of Zone A to define new beach accesses and maintain dune stability against erosion.

Fencing and existing access points throughout the rest of Zone A are in sound condition as the fencing was updated and straightened (approximately three years ago) and all existing beach access points are beach stairs. However, it is noted by the local community that during large events, such as Surf Lifesaving carnivals or the Sarina Beach Coconut Festival, there is a noticeably higher number of people jumping over fences to sit in the shady dune area or access the beach via unofficial access points. It is recommended that council investigate temporary fencing options for these times of year, similar to what is implemented during the Motorcycle Beach Races at Grasstree Beach, which will minimise disturbance to the dunes.

Inappropriate access by vehicles is noted as a threat to native vegetation within Zones A, C and D, particularly motorbikes and quadbikes. Typically, access to the foreshore is via private property with limited options for council to close these access points through fencing. It is recommended that council provide education to community members on the impact of vehicles on the beach, such as the risk of weed dispersal, erosion and impacts on nesting turtles and hatchlings. In addition, an education campaign to encourage locals and visitors to report illegal vehicle access is recommended. This could be achieved through signage, direct engagement with locals or advertising. Reporting of illegal vehicle access will help to increase the capacity of council to implement compliance activities aimed at deterring such behaviour.

Parking throughout Zone A has been noted as an ongoing issue by the local community, particularly for temporary/ overflow event parking. It is recommended that council review options for car parking areas to maximise the space available, with a focus on the area around Owen Jenkins Drive Park and SAR01 access point. Parking and access for the boat ramp facilities in Zone B are noted as being in good condition, with ample space and lighting in this area.





Figure 41: Sarina Beach access points.





**Figure 42:** Official access points in Zone A.





**Figure 43:** *Unofficial access track in the northern section of Zone A.*



**Figure 44:** *Disjointed fencing around SAR01.*



## 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.

In Zone A, beach access signage is present at the landward and seaward end of each beach access track throughout the coastal unit. At each landward beach access point there are crocodile warning signs present as well as signs advising of the correct treatment for jellyfish stings. There is additional signage at SAR01 regarding on-leash/off-leash dog-walking as well as an educational sign about the importance of marine turtles in this coastal unit (Figure 45). A similar marine turtle sign is present in the southern extent of the zone, in Owen Jenkins Drive Park. Signage to promote the nearby rock pools could also feature at SAR01. Additional signage could be installed along the esplanade fencing sharing information about whale migration and opportunities for whale watching from the foreshore of Sarina Beach, which is a major visitor attraction.

Signage at the boat ramps in Zone B is in good condition and includes regulatory signage, crocodile warnings, information on marine park boundaries and educational signage about marine fish habitats (Figure 46). Additional signage could be considered for the Perpetua Point lookout area, similar to the Lamberts Beach lookout.

Signage in Zone C is minimal, with crocodile warning and treatment of jellyfish sting signs and two small signs to indicate and introduce the start of the Sarina Inlet Trail (Figure 47). Installation of additional signage about Sarina Inlet and native vegetation along the trail would create educational opportunities. It is in this zone, within the road reserve on Sunset Drive that there is potential to include welcome and directional signage for visitors.

While the signage in the coastal unit is in good condition currently, it is recommended that signage be regularly audited and updated where required to ensure consistency and accuracy. Other signage for consideration includes informative signage on how to report illegal vehicle access to beaches at key locations.



Figure 45: Signage at SAR01.





Figure 46: Signage at the boat ramps in Zone B.



Figure 47: Signage at the Sarina Inlet Trail in Zone C.



## 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).

Sarina 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 Sarina Beach are drivers for tourism and visitation to the area. Local residents and tourists can contribute to the local economy by visiting Sarina Beach Motel, Sandpiper Motel, The Palm restaurant, Ampol service station or the Sarina Beach Store for the purchase of food, car and boat fuel, and camping equipment. Sarina Beach residents have expressed interest in supporting the local economy by increasing the recreational value of the Sarina Beach area to attract more visitation. Key examples include a desire to upgrade the lookout facilities at Perpetua Point and investigation of further opportunities for connection between Perpetua Point north to Campwin Beach, such as visual, walking or driving connections. The community have also expressed interest in developing passive recreational opportunities in Zone D, such as a mangrove boardwalk or interpretive signage.

Additionally, the Sarina Beach Coconut Festival and Surf Lifesaving carnival are major attractions to Sarina Beach each year. People travel to the area to participate and enjoy the activities these events have to offer, including palm weaving, tropical market shopping, camel races and rides, international kite flying displays (Figure 48) and local entertainment (Sarina Beach Coconut Festival 2021).

Indirect economic values of Sarina Beach include the environmental value of the Sarina Inlet – Ince 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 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 dumping and littering at Sarina Beach is minimal in part due to the presence of a post and rail fence along most of the esplanade, which prevents vehicle access. The only waste dumping that appears to be an issue in the coastal unit is green waste. Two green waste piles were found on the foredunes of the beach consisting of palm fronds and coconuts (Figure 49)





**Figure 48:** Kite flying at the Sarina Beach Coconut Festival (photo from Sarina Beach Coconut Festival Facebook page).

and other green waste is scattered along the edge of Zone D, adjoining the residential area. The accumulation of woody debris in Zone D both via tidal influence and illegal dumping poses a fire risk to the vegetation and nearby residential area.

Dumping of lawn clippings and emptying of pot plants onto the foredune is also noted as an issue and is identified as a key vector of spread for non-native grasses, groundcover species and nuisance weeds. A public education and awareness

program on the values of the coastal unit and impacts of waste dumping is recommended.

While the beach has generally low amounts of marine debris, holding a beach clean-up event would help to maintain this status and strengthen local stewardship and ownership to keep their beach in its current clean condition.



**Figure 49:** Green waste on Sarina Beach.







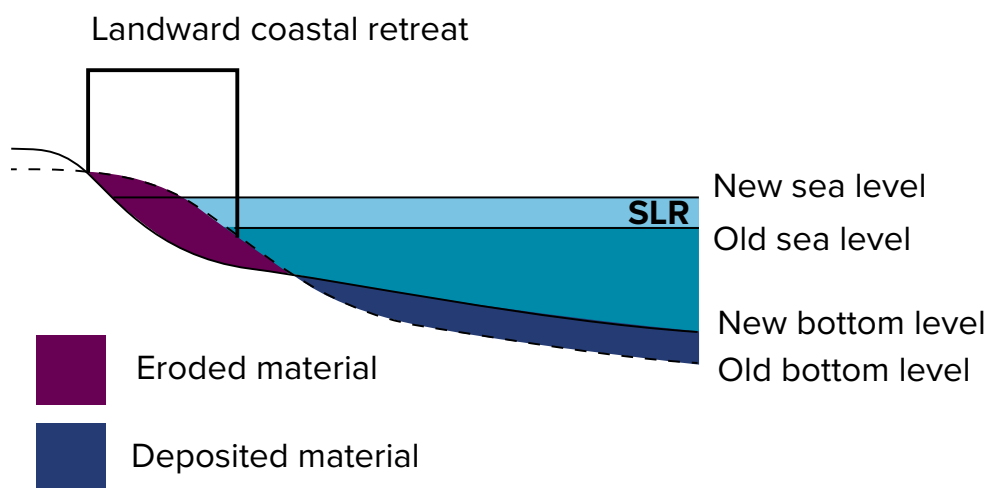
# 6 Climate Change and Management Issues

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). 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 50).



Application of the Bruun Rule showing erosion of the upper beach and offshore deposition under sea level rise (SLR) (Source: DERM adapted from <sup>37</sup>).

**Figure 50:** The Bruun Rule showing erosion of the upper beach and offshore deposition under sea level rise (SLR) (Source: DERM).

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 51 (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 51 also highlights other key changes associated with climate change, such as increased temperatures and more severe tropical storms.

Queensland has five different coastal regions due to variations in coastal, climatic and geological processes and anthropogenic factors. Thus, each region has different characteristics, coastal management issues and vulnerability to climate change (DERM 2011b). One of the most significant impacts for Sarina Beach, as a result of climate change, will be the rising sea level (Figure 51). Photo evidence shows sea foam throughout the residential area adjoining Zone A as a result of Tropical Cyclone Debbie in 2017 .



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.

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.

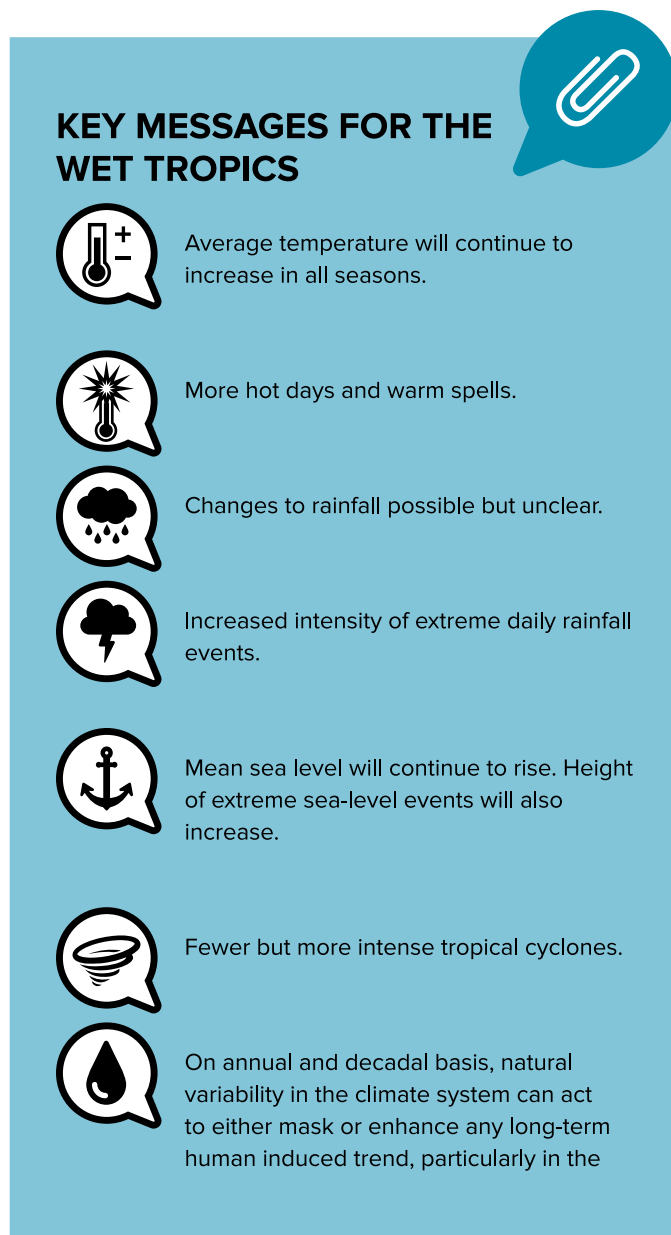
Rising temperatures will probably see the migration of vegetation communities southward or to higher elevations in order for the plant assemblages to stay within their optimal physiological limits (Huntley 1991). The migration of communities down the coast would be enabled if vegetation

corridors and buffers existed, providing space for vegetation to grow. Therefore, migration could be facilitated by supporting natural regeneration or actively revegetating the coastal zones and corridors.

The increased frequency of extreme weather events, such as storms, is likely to have significant impacts on the foredunes at Sarina 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. 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. At Sarina Beach there is limited input of sediment to the coastal unit from longshore drift. Thus, the sand supply that is currently held within the sand dunes and that is cycling through the area in short-term erosion and accretion processes, is important to retain.

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 Sarina 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. This can be achieved by minimising hard infrastructure (such as seawalls), improving dunal vegetation condition and minimising disturbance to the dunes (such as unofficial access points). Reducing environmental pressures will increase the resilience of coastal ecosystems, thereby increasing the likelihood of their persistence into the future. Improving vegetation condition for the purpose of capturing and retaining sand deposits, particularly along the sandy foreshore of Zone A, will therefore be critical to protecting the natural and recreational values of Sarina Beach.

At Sarina Beach, tidal flat communities extend throughout Zone D and mangroves adjoin Zone C (Figure 52). The tidal flats are on a council-managed road reserve parcel, and the area is a known illegal dumping hotspot. The tidal flats are also being impacted by vehicle access, with that area and the area extending north towards Campwin Beach acting as a pathway for illegal vehicle access to Sarina Beach. It is recommended that council work with the community to increase reporting of illegal activity and increase compliance where appropriate, to reduce impacts to the tidal flat communities as well as the foreshore. Council should also consider fire risk within this area, and work with the community to ensure appropriate fire breaks are maintained. Adjacent land should remain free of development and infrastructure to allow for migration of these tidal communities as sea level changes occur. These are highly sensitive areas that should be fenced to restrict vehicle and pedestrian access.



### 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

**Figure 51:** Key climate messages for the wet tropics Natural Resource Management (NRM) cluster (Source: Abbs et al. 2015)





**Figure 52:** Tidal flat communities at Sarina Beach.



# 7 Prioritised Actions

Council have reviewed the findings of the report and have developed the following prioritised list of actions. 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.
4. **Continuous** actions are intended to be undertaken throughout the lifespan of the Local Coastal Plan.

**Table 3: MRC Prioritised Actions for the Sarina Beach Local Coastal Plan Area**

PRIORITISED ACTIONS		PRIORITY
ALL ZONES		
1	<b>Vegetation Management</b>	
	1.1. Undertake detailed weed mapping for each zone to guide control measures outlined in 1.2	High
	1.2. Control with the intent to eradicate invasive weed species across all zones with specific targeting in accordance with the following. Measures are to include supplementary planting of local native species, where appropriate, to infill areas of sizable disturbance:	
	<ul style="list-style-type: none"> <li>• Mother of millions (<i>Bryophyllum sp.</i>), Singapore Daisy (<i>Sphagneticola trilobata</i>) and Prickly Pear (<i>Opuntia sp.</i>)</li> </ul>	High
	<ul style="list-style-type: none"> <li>• Periwinkle (<i>Catharanthus roseus</i>), spurge (<i>Euphorbia</i>), Siratro (<i>Macropodium atropurpureum</i>) Cobbler Peg (<i>Bidens pilosa</i>), joy weed (<i>Alternanthera brasiliana</i>), coral creeper (<i>Barleria repens</i>), Chinese violet (<i>Asystasia gangetica</i>), agave (<i>Agave attenuata</i>), Mock orange (<i>Murraya paniculata</i> "Exotica"), Leucaena (<i>Leucaena leucocephala</i>), Balsam Pear (<i>Momordica charantia</i>), Eastern cassia (<i>Senna pendula</i>), Seaforth burr (<i>Cenchrus echinatus</i>).</li> </ul>	Medium
	<ul style="list-style-type: none"> <li>• Gazania (<i>Gazania tomentosa</i>), Mother-in-law's tongue (<i>Sansevieria trifasciata</i>) Devils Horsewhip (<i>Achyranthes aspera</i>).</li> </ul>	Low
	1.3. Revegetate the Sarina Beach foreshore with species suited to the Regional Ecosystem, and with consideration of view-sensitivity.	Medium
1.4. Develop a community education program to develop a better understanding of local ecology and addressing issues associated with garden escapees and green waste dumping.	Medium	
1.5. Work with the Freehold property owners to facilitate protection and appropriate management of native vegetation on Freehold land.	Continuous	
1.6. Engage with relevant stakeholders such as fire brigades, Queensland Fire Emergency Services, Queensland Fire and Biodiversity Consortium, and Queensland Parks and Wildlife Services, to assess fire risk of vegetation and work together to develop a fire management plan.	High	
2	<b>Erosion management</b>	
2.1. Minimise disturbance to dunes and vegetation along all shoreline areas and, encourage vegetation establishment to provide additional resistance to erosion (accretion).	Continuous	
3	<b>Cultural heritage</b>	
	3.1. Consult with Traditional Owners regarding proposed actions within the Native Title determination area.	High
	3.2. 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
3.3. Work with Traditional Owners to facilitate connection to Country.	Continuous	



<p><b>4 Signage</b></p> <p>4.1. Audit signage across the coastal unit to determine gaps and needs to ensure proper identification of beach accesses, ensure adequate warning of hazards and first aid treatments, improve wayfinding and to regulate and report prohibited activities.</p> <p>4.2. Identify opportunities for additional interpretive signage across the coastal unit to enhance sense of place and promote local attractions and history.</p>	<p><b>High</b></p> <p><b>Medium</b></p>
<p><b>5 Climate change</b></p> <p>5.1. Identify options to increase community resilience and understanding of hazards including sea level rise, coastal erosion, fire and other hazards anticipated to impact the coastal unit.</p> <p>5.2. Plan for a coastal area erosion (retreat) as required.</p>	<p><b>Continuous</b></p> <p><b>Medium</b></p>
<p><b>6 Legislation and local laws</b></p> <p>6.1. Use available legislation to assist in protecting existing remnant vegetation within the management zones of the coastal unit.</p> <p>6.2. Review and update this document in line with changing legislation.</p>	<p><b>Continuous</b></p> <p><b>Continuous</b></p>
<p><b>7 Partnerships</b></p> <p>7.1. Identify potential partner organisations with an interest in facilitating community programs to assist with:</p> <ul style="list-style-type: none"> <li>• Local weed species and the use of local native species in residential gardens.</li> <li>• Garden waste and general waste disposal.</li> <li>• Responsible pet ownership and how to protect native wildlife.</li> <li>• Threats to turtles nesting such as lighting and unauthorised vehicle access</li> <li>• Education about the impacts of activities to fragile coastal environments.</li> </ul>	<p><b>Continuous</b></p>
<p><b>8 Monitoring</b></p> <p>8.1. 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.</p> <ul style="list-style-type: none"> <li>• Review profile changes where different protection works are implemented – including the rock seawall, dune re-building, and vegetated areas.</li> <li>• Use monitoring results to inform future coastal management works for Sarina Beach (adaptive management).</li> </ul> <p>8.2. Consider a regional study on the long-term sediment (sand) supply for the Mackay coastline.</p> <p>8.3. Monitor, or in partnership with others, assist with the monitoring of shorebirds and turtles.</p> <p>8.4. Monitor and inform the community on progress made in delivering the management activities outlined in the LCP.</p>	<p><b>High</b></p> <p><b>High</b></p> <p><b>Continuous</b></p> <p><b>Continuous</b></p>
<p><b>9 Waste management</b></p> <p>9.1. Work with the community to develop suitable solutions to manage green waste.</p> <p>9.1. Promote services available at the Sarina Rural Transfer Station and council's dump voucher system.</p>	<p><b>High</b></p> <p><b>Medium</b></p>



## PRIORITY ACTIONS

## PRIORITY

### Zone A | Owen Jenkins Drive Park and esplanade area north to Stewart Grove (3.39ha)

10	<b>Vegetation management</b>	
10.1.	Manage coastal vegetation to reconcile competing demands for beach views and access with shoreline and habitat protection.	High
10.2.	Increase view-sensitive vegetation cover at the northern end of the zone. The planting palette should be appropriate to the relevant Regional Ecosystem, and consider species which will support turtle nesting and be view-sensitive.	High
10.3.	Promote diversity of native vegetation within the dune areas to maximise the capacity of this vegetation to protect the foredunes.	Continuous
10.4.	Undertake a staged renewal of existing beach protection fencing	Continuous
11	<b>Recreational opportunities</b>	
11.1.	Complete planned works in Owen Jenkins Park to improve the barbeque facilities	High
11.2.	Review appropriateness of car parking throughout Zone A, particularly near SAR01 and Owen Jenkins Drive Park.	Low
11.3.	Maintain viewing corridors from picnic shelters in Owen Jenkins Drive Park.	Low
12	<b>Access management</b>	
12.1.	Formalise an additional beach access between SAR01 and SAR02.	High
12.2.	To align the LCP with the policy requirements of the Queensland Coastal Management Plan (2014) and Mackay Regional Council Coastal Management Guidelines (2012), post and rail fencing will be extended from Owen Jenkins Park and esplanade area to the northern end of Zone A to define tenure, designate access points and maintain dune stability against erosion.	Medium
12.3.	Install temporary fencing to protect dunal areas during events that result in high visitor numbers, such as the Sarina Beach Coconut Festival and Surf Lifesaving carnivals.	Continuous
13	<b>Signage</b>	
13.1.	Additional interpretive signage to be installed to direct people to the new beach access	Medium
<b>Zone B   Captain Blackwood Drive Reserve (7.49ha)</b>		
14	<b>Vegetation management</b>	
14.1.	Manage vegetation where required to maintain views from the lookout.	High
15	<b>Recreational activities</b>	
15.1.	Finalise the feasibility assessment and undertake recommended actions for the upgrade of the lookout point along Captain Blackwood Drive at Perpetua Point.	Medium
15.2.	Investigate the opportunities to provide connections (visual, walking or driving) between the Perpetua Point Lookout and the Campwin Beach Lookout.	Medium



**Zone C | Road reserve on Sunset Drive and coastal strip adjoining Ferries Terrace (1.1ha)**

**16 Vegetation management**

- 16.1. Work with neighbouring Freehold property owners to facilitate protection and appropriate management of native vegetation along Johnsons Beach, to prevent the reintroduction of weeds into council land.
- 16.2. Support the ongoing management of native vegetation along the Sarina Inlet Trail by Sarina Landcare Catchment Management Association (SLCMA).

**Medium**

**Medium**

**17 Recreational opportunities**

- 17.1. Improve presentation of the Sarina Beach Road on arrival to the township. Consider use of welcome signage and landscape improvements.

**Medium**

**Zone D | Road reserve behind Poole Street (9.18ha)**

**18 Vegetation management**

- 18.1. Consider fire risk within the road reserve parcel behind Poole Street, and work with residents to ensure the fire break is maintained.

**High**



# 8 Implementation and Review

The implementation of the *Sarina 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 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) Limited and local Landcare group Sarina Catchment Landcare Management Association (SCLMA).
- 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 *Sarina 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.







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# 10 Appendices

**APPENDIX 1:** *Clarke Connors Range Fire Management Guidelines* (currently being revised).

**APPENDIX 2:** Regional Ecosystem (RE) descriptions as found on Council managed land within the coastal unit

**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 Sarina Bay and dominates the northern section of the foreshore. The mangrove communities in the Sarina 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 Sarina Beach Coastal unit area can be found within the Clarke Connors Ranges Fire Management Guidelines (Reef Catchments 2009).

**RE 8.1.2** co-colonises the established mangrove systems associated with RE 8.1.1 in both the northern and southern

estuarine wetlands. Pockets of this vegetation occur between Johnsons Beach and Perpetua Point headland, and west of the coastal unit throughout the tidal wetlands. RE 8.1.2 is adjacent to mangroves with soils consisting of marine sediment. Forblands at Sarina Beach contain characteristic succulent saline-adapted herbaceous species. This vegetation can cope with salt accumulation at the soil surface from evaporation of sea water, which inundates these areas during the higher tides. With regards to fire management, RE 8.1.2 is typically inflammable but it often merges with the fire supporting saltwater couch grassland.

**RE 8.2.2** describes a semi-evergreen microphyll vine thicket to vine forest on coastal dunes. This vegetation community is known to stabilise sand dunes and can protect coastal communities and inland vegetation from storm surges. A 0.6ha patch of this critically endangered beach scrub exists within the coastal unit in Zone D. This patch is unmapped by standard regional ecosystem mapping, but was identified during a fine-scale mapping project in 2008. It is threatened by encroachment (i.e. mowing) and weed infestations from neighbouring Freehold land. The height of the canopy varies between 1-25 m and is dependent on the level of exposure to external factors such as salt laden winds. RE 8.2.2 canopy consists primarily of rainforest species on coastal dunes with trees such as red condoo (*Mimusops elengi*), tuckeroo (*Cupaniopsis anacardioides*), and in some places, brown tulip oak (*Argyrodendron polyandrum*), scaly ebony (*Diospyros geminata*), yellow tulipwood (*Drypetes deplanchei*), droopy leaf (*Aglaia elaeagnoides*), canary beech (*Polyalthia nitidissima*), scaly ash (*Ganophyllum falcatum*), yellow boxwood (*Planchonella pohlmaniana*), mongo (*Sersalisia sericea*) and peanut tree (*Sterculia quadrifida*). A low tree or shrub layer and the ground layer is present but sparse. Vines such as burney vine (*Trophis scandens*), native jasmine (*Jasminum didymum*) and smooth water vine (*Cissus oblonga*) are common and epiphytes such as the golden orchid (*Dendrobium discolor*) are also found within the tree branches. Many plants found within this ecosystem will return after fire (i.e. rainforest pioneers), however the ecosystem is highly fire sensitive and should not be burned. Weeds alter the structure of the ecosystem and add to the fuel load, which translates to a greater risk of additional fire and high intensity fire. Disturbance by fire promotes weed infestation including by Guinea grass (*Megathyrsus maximus*).

**RE 8.3.5** is a sparse woodland community on alluvial plains. The endangered ecosystem is dominated by *Eucalyptus platyphylla*, *Lophostemon suaveolens* and/or *Corymbia clarksoniana*. There is frequently a vary sparse lower layers of trees, as well as a shrub layer. The ground layer is notably very diverse, and commonly dominated by *Imperata cylindrica*, *Themeda triandra*, *Heteropogon triticeus*, *Eragrostis brownii* and/or *Sorghum nitidum forma aristatum*. This RE has been extensively cleared for sugar cane and is highly fragmented where most remnants are very small. The largest remnants are mainly south of Sarina where they are currently subject to clearing for coastal development and expansion of sugar and readily subject to weed invasion.

**RE 8.12.22** is a hilly woodland community with a canopy dominated by *Eucalyptus drepanophylla* and/or *Corymbia clarksoniana*. RE 8.12.22 covers the Perpetua Point headland at Sarina Beach. This patch has been impacted by the development of boat ramps, Sunset Drive, a carpark and housing along Captain Blackwood Drive. Additional ongoing impacts here are weeds and inappropriate fires. Fire Management Guidelines for Regional Ecosystems within the Sarina Beach Coastal unit area can be found within the Clarke Connors Ranges Fire Management Guidelines (Appendix 1) and suggest that this ecosystem should only be burned every 3-7 years. There is also a thin remnant strip of RE 8.12.22 along Sarina Coast Road between Sunset Drive and Ferries Terrace. The patch increases in size near Johnsons Beach, where the road and residential development are more offset from the coast. In this patch, inappropriate vehicle access and weeds are the key management issue.



### 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

Appendix 4 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 pre-clearing Regional Ecosystem mapping, and site-specific conditions (such as aspect, topography, existing vegetation, soil condition, availability of appropriate plants, etc.).

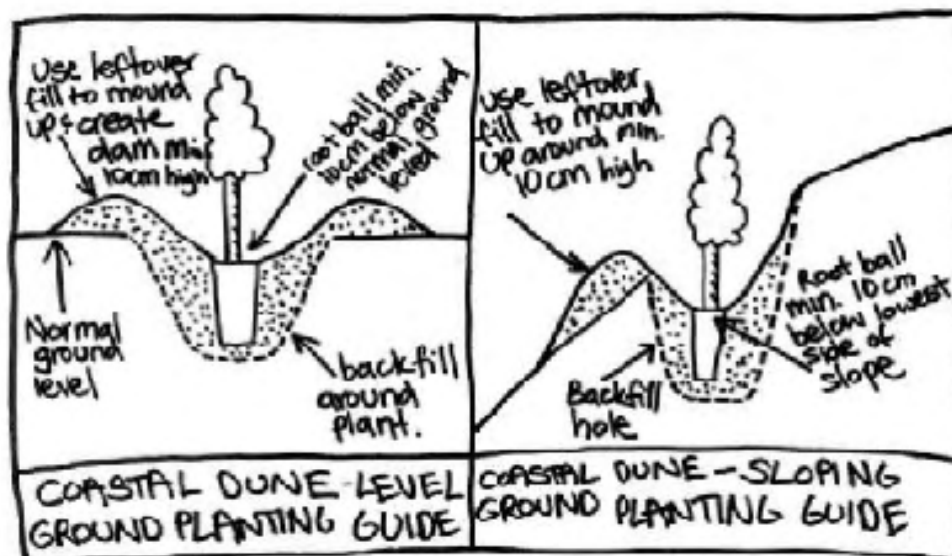


Figure 53: Coastal dune planting guide.



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

Regional Ecosystem mapping shows the vegetation communities within a bioregion for any given land parcel. A biodiversity status or broad vegetation group map request can be obtained to guide species placement and suitability. <https://apps.des.qld.gov.au/map-request/re-broad-veg-group/>

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

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

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

<i>Jasminum didymum</i>	native jasmine	Climber/Shrub	8.2.2; 8.2.6
<i>Lomandra longifolia</i>	spiny-headed mat-rush	Herb	8.2.6
<i>Macaranga tanarius</i>	macaranga	Tree	8.2.2; 8.2.6
<i>Mallotus philippensis</i>	red kamala	Tree	8.2.2; 8.2.6
<i>Melia azedarach</i>	white cedar	Tree	8.2.6
<i>Mimusops elengi</i>	red coodoo	Tree	8.2.2
<i>Morinda citrifolia</i>	giant morinda, cheese fruit, smelly cheese tree	Tree	8.2.1
<i>Pandanus tectorius</i>	beach pandan, coastal screw, pine pandanus	Tree	8.2.1; 8.2.6
<i>Pittosporum ferrugineum</i>	rusty pittosporum	Tree	8.2.1; 8.2.6
<i>Planchonia careya</i>	cocky apple	Tree	8.2.6
<i>Pleiogynium timorense</i>	Burdekin plum	Tree	8.2.2; 8.2.6
<i>Scaevola taccada</i>	sea lettuce	Shrub	8.2.1
<i>Sophora tomentosa</i>	silver bean	Shrub	8.2.1
<i>Spinifex sericeus</i>	beach spinifex	Grass	8.2.1
<i>Sporobolus virginicus</i>	marine couch	Groundcover	8.2.1
<i>Stephania japonica</i>	tape vine	Climber/groundcover	8.2.1; 8.2.2; 8.2.6
<i>Sterculia quadrifida</i>	peanut tree	Tree	8.2.2; 8.2.6
<i>Terminalia muelleri</i>	coast damson	Tree	8.2.1; 8.2.2; 8.2.6
<i>Themeda triandra</i>	kangaroo grass	Grass	8.2.6; 8.2.9
<i>Thespesia populnea</i>	tulip tree	Tree	8.2.1
<i>Thuarea involuta</i>	birds beak grass	Grass	8.2.1
<i>Vigna marina</i>	vigna	Groundcover	8.2.1
<i>Vitex rotundifolia</i>	creeping vitex, beach vitex	Groundcover	8.2.1
<i>Vitex trifolia</i>	coastal vitex, common blue vitex	Shrub	8.2.1
<i>Xerochrysum bracteatum</i>	golden everlasting daisy	Herb	8.2.9

**View sensitive native plant list**

Species name	Common name	Habit	Regional Ecosystem
<i>Acacia simsii</i>	Sim's wattle	Shrub	8.2.6
<i>Caesalpinia bonduc</i>	nicker nut	Climber	8.2.1
<i>Canavalia rosea</i>	beach bean	Groundcover	8.2.1
<i>Clerodendrum inerme</i>	coastal lollybush	Shrub	8.2.1
<i>Crinum pedunculatum</i>	river lily, swamp lily	Tufty	8.2.1
<i>Crotalaria mitchellii</i>	sand rattlepod	Herb	8.2.9
<i>Cymbopogon refractus</i>	barbed wire grass	Grass	8.2.9
<i>Cyperus pedunculatus</i>	pineapple sedge	Sedge	8.2.1; 8.2.9
<i>Dianella caerulea</i>	blue flax lily	Herb	8.2.6; 8.2.9
<i>Dianella longifolia</i>	smooth flax lily	Herb	8.2.6a; 8.2.9
<i>Dodonaea viscosa subsp. viscosa</i>	sticky hop bush	Shrub	8.2.1



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

<i>Eragrostis interrupta</i>	coastal love grass	Grass	8.2.6; 8.2.9
<i>Eriachne triodioides</i>	wanderrie grass	Grass	8.2.6; 8.2.9
<i>Eustrephus latifolius</i>	wombat berry	Climber	8.2.2; 8.2.6
<i>Geitonoplesium cymosum</i>	scrambling lily	Climber	8.2.2; 8.2.6
<i>Heteropogon triticeus</i>	giant spear grass	Grass	8.2.6; 8.2.9
<i>Hibbertia scandens</i>	golden Guinea flower, snake vine	Climber/groundcover	8.2.1
<i>Imperata cylindrica</i>	blady grass	Grass	8.2.6; 8.2.9
<i>Ipomoea pes-caprae</i>	goats foot convolvulus	Groundcover	8.2.1
<i>Jasminum didymum</i>	native jasmine	Climber/shrub	8.2.2; 8.2.6
<i>Lomandra longifolia</i>	spiny-headed mat-rush	Herb	8.2.6
<i>Scaevola taccada</i>	sea lettuce	Shrub	8.2.1
<i>Sophora tomentosa</i>	silver bean	Shrub	8.2.1
<i>Spinifex sericeus</i>	beach spinifex	Grass	8.2.1
<i>Sporobolus virginicus</i>	marine couch	Groundcover	8.2.1
<i>Stephania japonica</i>	tape vine	Climber/groundcover	8.2.1; 8.2.2; 8.2.6
<i>Themeda triandra</i>	kangaroo grass	Grass	8.2.6; 8.2.9
<i>Thuarea involuta</i>	birds beak grass	Grass	8.2.1
<i>Vigna marina</i>	vigna	Groundcover	8.2.1
<i>Vitex rotundifolia</i>	creeping vitex, beach vitex	Groundcover	8.2.1
<i>Vitex trifolia</i>	coastal vitex, common blue vitex	Shrub	8.2.1
<i>Xerochrysum bracteatum</i>	golden everlasting daisy	Herb	8.2.9

**APPENDIX 5: Weed control principles**

PRINCIPLES	COMMENTS
<b>Staged weed removal</b>	<ul style="list-style-type: none"> <li>• Weed removal should be carried out in a staged approach.</li> <li>• Work outwards from intact remnants of coastal vegetation as a priority.</li> <li>• Particularly important in removal of non-native vegetation along the dune scarp.</li> <li>• 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 weed species.</li> </ul>
<b>Physical weed removal</b>	<ul style="list-style-type: none"> <li>• Physical weed removal, including hand pulling, chipping or cutting weeds is effective in small infestations and environmentally sensitive areas.</li> </ul>
<b>Mechanical weed removal</b>	<ul style="list-style-type: none"> <li>• Mowing or brushcutting will suppress weed growth, discourage seeding and spread.</li> <li>• This method should be used particularly in areas bordering large infestations.</li> <li>• Care should be taken to reduce potential disturbance as excessive mowing and brushcutting can facilitate further weed growth and reduce regeneration of native vegetation.</li> </ul>
<b>Herbicide weed removal</b>	<ul style="list-style-type: none"> <li>• The application of herbicides includes foliage or basal spraying, cut / paint and stem injection where possible.</li> <li>• 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' application to minimise non-target impacts.</li> <li>• Roundup Bi-active is recommended due to its low toxicity to wildlife and humans.</li> </ul>
<b>Timing</b>	<ul style="list-style-type: none"> <li>• Weed control on foredunes to occur between April and October only, to avoid turtle nesting season (November to March).</li> <li>• Weed control on hind dunes can occur at any time of 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.</li> <li>• Wind speed and direction is a consideration when using herbicide to minimise spray drift. Other herbicide applications such as cut and paint method minimises release of herbicide into the environment.</li> </ul>
<b>Consideration of fire risk</b>	<ul style="list-style-type: none"> <li>• 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 chance of fire reaching the canopy.</li> <li>• Mulching down of large, dense areas of dead, woody weeds using brushcutters or hand tools, would similarly reduce fire risk and allow native plants a better chance at regeneration.</li> </ul>
<b>Preventing re-infestations</b>	<ul style="list-style-type: none"> <li>• Keep maintenance vehicles on the existing tracks where possible to reduce disturbance.</li> <li>• Clean maintenance vehicles before and after access to the site to prevent weed spread or introduction.</li> <li>• 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.</li> </ul>



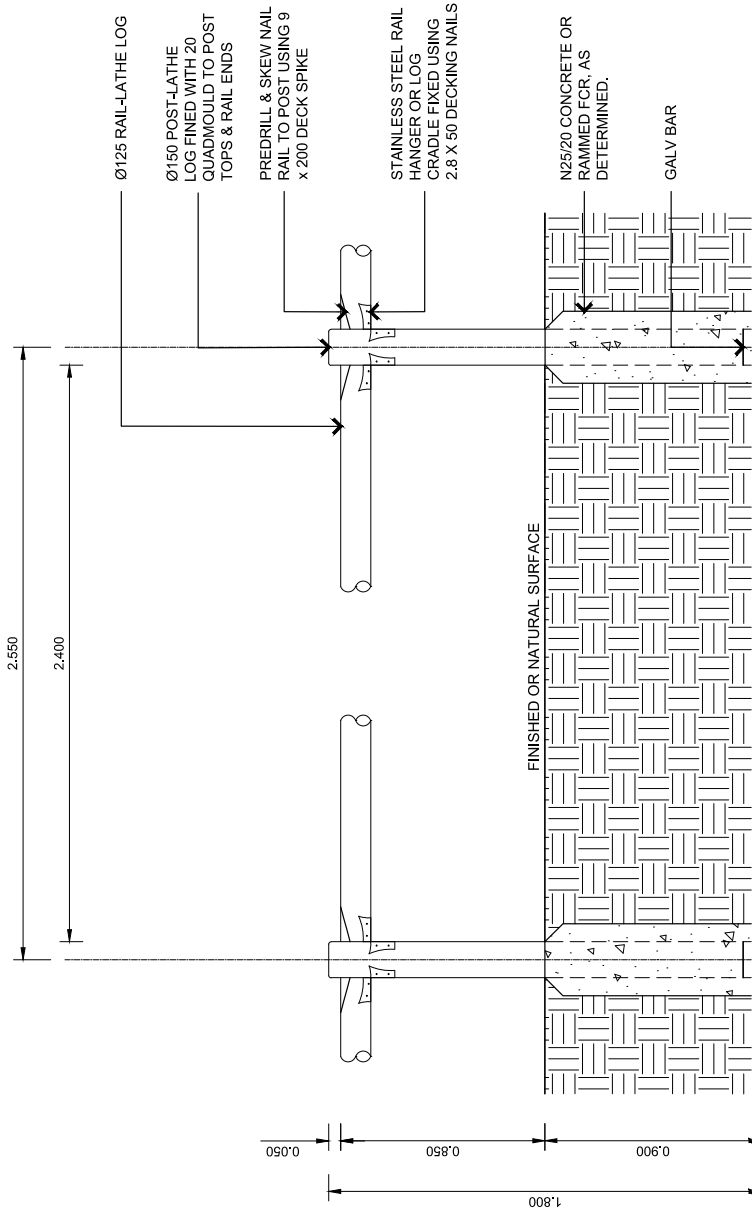
**APPENDIX 6: Main weed species found in coastal areas in the Mackay region**

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

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

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

STANDARD		SHEET 1 OF 1	
POST & RAIL DETAIL		WORKS JOB No.	
BEACH ENVIRONMENT		DRAWING No. AMEND.	
		A3-00160 B	
		DIRECTOR OF PLANNING AND COMMERCIAL INFRASTRUCTURE ORIGINAL SIGNED BY S. M. HOLLEY STUART HOLLEY DATE 13.11.06	
DATE	DESCRIPTION	DATE	DATE
13.11.06	REVISED FORMAT	13.11.06	13.11.06
13.11.06	REDUCED POST SPACINGS	13.11.06	13.11.06
	ORIGINAL ISSUE		
	AMENDMENTS AND REVISIONS		
	STANDARD DRAWING/PARKS & GARDENS		





## **Sarina Beach 2022**

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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