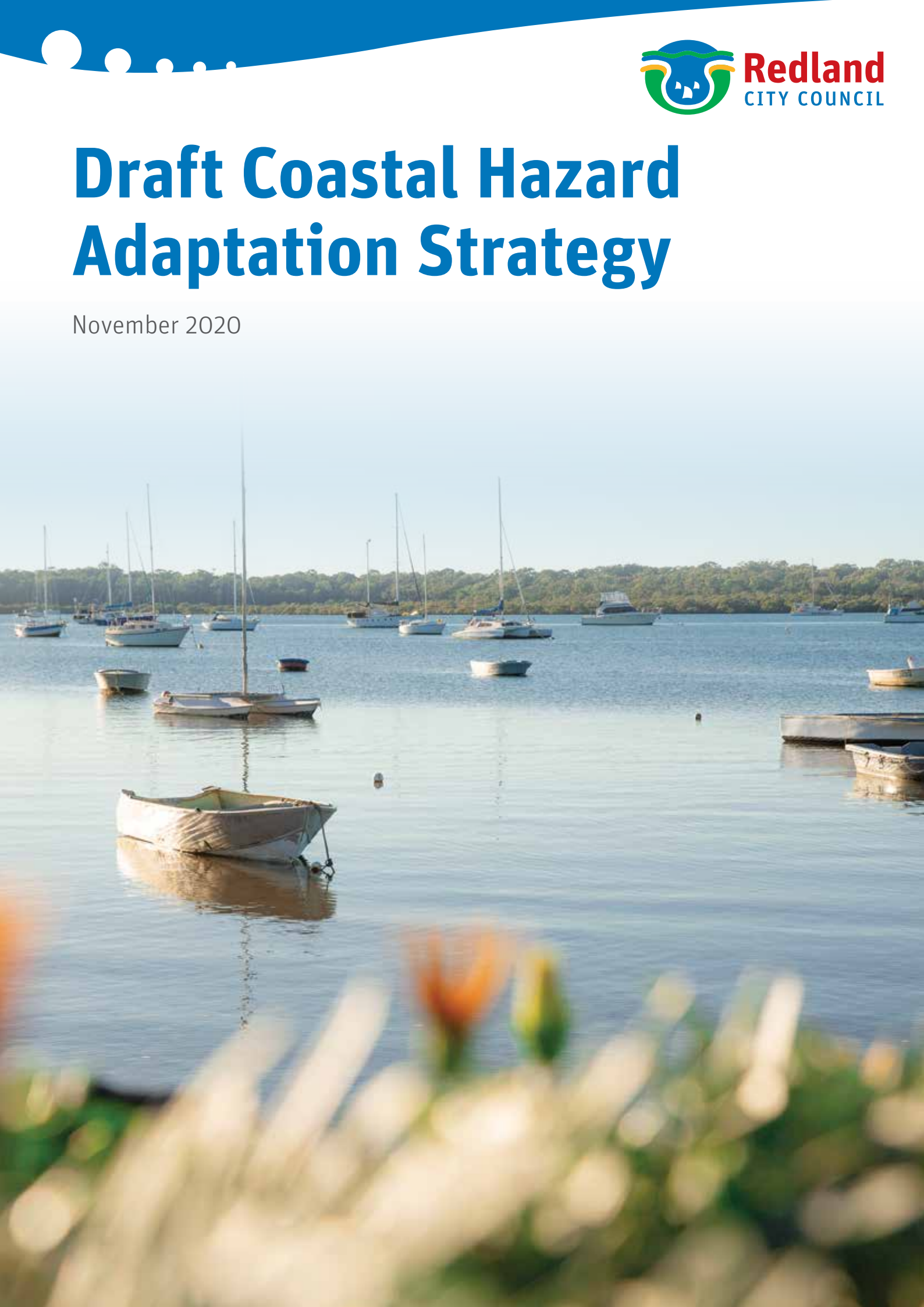
Redland CITY COUNCIL

Draft Coastal Hazard Adaptation Strategy

November 2020



Foreword

Redlands Coast is blessed with approximately 335 kilometres of coastline and foreshore areas.

The city has a rich and long history and is the traditional and spiritual home of the Quandamooka People. The coastal zone has significant ecological value and includes Ramsar listed sites and parts of the Moreton Bay Marine Park.

The coastal environment also holds significant recreational, commercial, and eco- and cultural tourism value. Renowned for scuba diving, boating, and recreational and commercial fishing, these values have seen Redlands Coast become a popular place for us to live and work, and is home to more than 150,000 residents, many of who live adjacent to or within proximity to the coastline. The coastal landscape and access to the coast underpins our economy.

Coastlines are dynamic, ever-changing with each tide and storm event. Erosion and storm tide inundation are natural processes that shape the coast over long timeframes. These processes are referred to as coastal hazards when they impact on how we use and enjoy the coast.

The Redlands Coast is currently prone to coastal hazard impacts, driven by cyclones and storm events. Coastal hazard impacts are also predicted to increase with a changing climate.

The Queensland State Government and Local Government Association of Queensland (LGAQ) provided funding to Queensland coastal councils to develop a strategic approach to managing coastal hazards. With the funding awarded to Redland City Council, we have been able to develop this Coastal Hazard Adaptation Strategy.

Our Coastal Hazard Adaptation Strategy enables us to be better prepared to reduce the impacts of coastal hazards on our communities, environment, cultural values, infrastructure, liveability and services, now and to the years 2070 and 2100.



Gorge Walk, North Stradbroke Island (Minjerrabah)

Front cover image: Southern Moreton Bay Islands

This report has been prepared by:

alluvium

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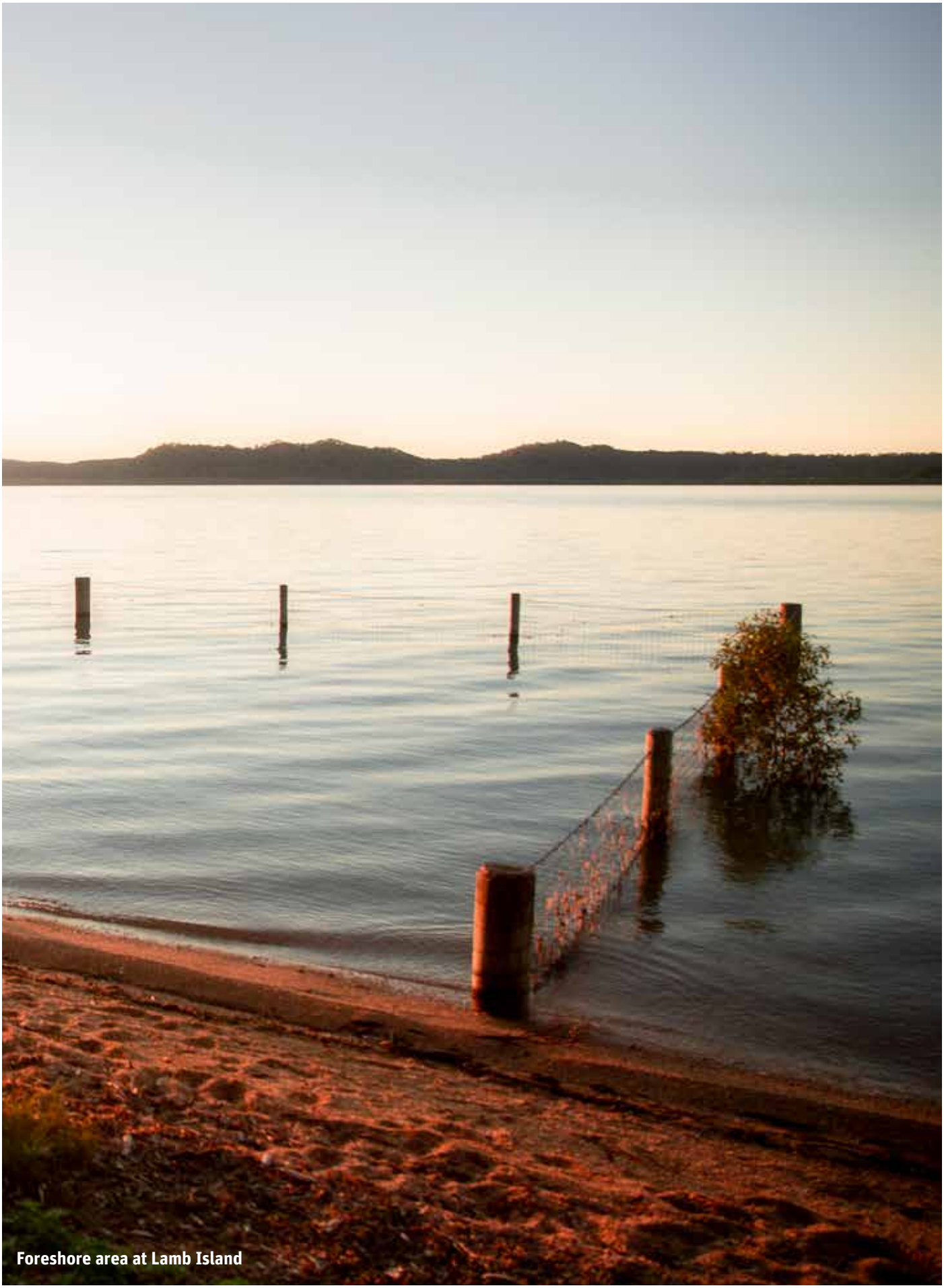
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Foreshore area at Lamb Island

1 Introduction

1.1 Redland City

The Redland City Local Government Area (LGA), also known as Redlands Coast, includes approximately 335 kilometres of coastline and foreshore (Figure 1).

The coastal zone extends from Tingalpa Creek at Thorneside south to the mouth of the Logan River and across the Southern Moreton Bay Islands and North Stradbroke Island (Minjerribah). North Stradbroke Island forms a barrier between the Coral Sea and Moreton Bay (Mulgumpin).

The Traditional Owners are the Quandamooka People who have cared for the land and sea of this ancient landscape for thousands of years. The Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) has recognised Native Title rights under the *Native Title Act 1993*.

The landscape has been shaped by coastal processes over thousands of years. Erosion and accretion of the shoreline, and inundation of coastal areas, are part of these natural processes. However, these processes can become coastal hazards when they have the potential to impact on infrastructure, access, services, our lifestyle and the economy.

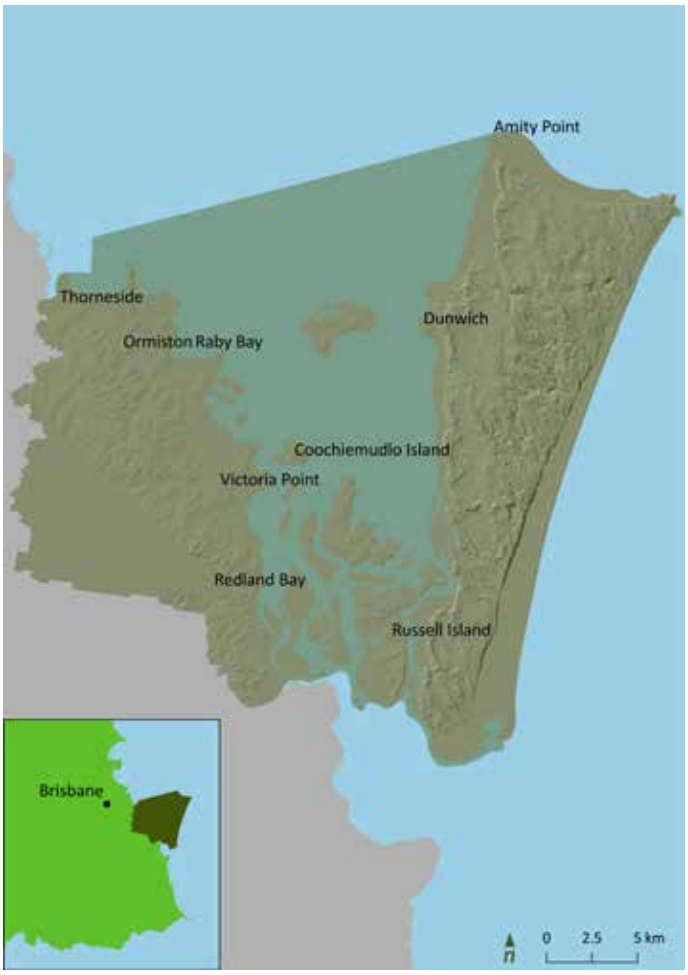


Figure 1. Redlands Coast (within the Redland City LGA)

1.2 Strategy purpose and approach

Context

The QCoast2100 program is a statewide initiative of the Queensland State Government and Local Government Association of Queensland (LGAQ). The program was launched to help Queensland coastal councils proactively plan for managing coastal hazard impacts, from present-day to the years 2070 and 2100.

Redland City Council was awarded funding through the QCoast2100 program to develop its Coastal Hazard Adaptation Strategy.

The Coastal Hazard Adaptation Strategy has been:

- Developed to proactively manage the impact of coastal hazards, now and into the future
- Developed in consultation with stakeholders and communities
- Tailored to include our full coastal landscape and communities.

Purpose

The purpose of the Strategy is to:

- Inform future decisions regarding the protection and management of our coast and foreshore
- Inform future land use planning
- Guide the management of public utilities and facilities
- Guide the management of areas of environmental and cultural significance
- Foster collaboration, and the shared care of our coastline.


Raby Bay canal estate



GJ Walter Park, Cleveland

Approach

The Coastal Hazard Adaptation Strategy has been developed through an eight-phase process (Figure 2) as outlined in the QCoast2100 Minimum Standards & Guidelines (LGAQ and DEHP 2016)[1].

The process has included a series of studies and activities that sought to:

- Identify coastal hazard areas
- Understand vulnerabilities and risks to assets
- Engage with the community to understand the preferred approaches to adaptation
- Determine adaptation actions, costs, priorities, and timeframes for implementation.

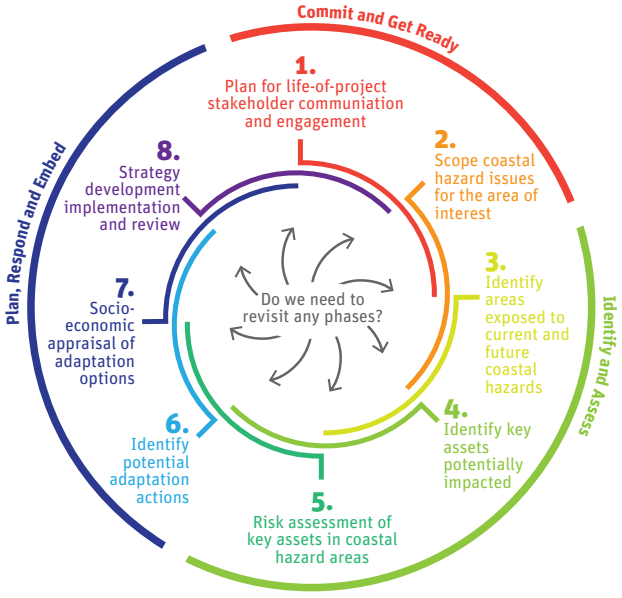


Figure 2. QCoast2100 eight-phase process

1.3 Engagement

Process

The Strategy development has been informed through consultation with key stakeholder groups and our Redlands Coast communities.

Engagement activities have included:

- Information sessions in August 2018 for business owners, community groups, and residents at risk from coastal hazards to provide background information on the Coastal Hazard Adaptation Strategy development
- Workshops with Council and external asset owners in August and September 2018, and February 2019, to help build awareness, prioritise coastal assets and values, and outline the risk assessment approach. This included representatives from local businesses, Redland City Council, QYAC, and cultural heritage experts
- Online workshops and discussions with key stakeholders occurred from May to November 2020
- An online 'Our Coastal Values and Experiences' survey was open from June to July 2020 to seek feedback from the community on coastal values and preferences for adaptation approaches
- Consultation on the draft Strategy from November to December 2020.

[1] https://www.qcoast2100.com.au/

Communication

A dedicated page on Redland City Council's Your Say website was used for publicising the project, sharing information, and encouraging registration and participation.

A range of communication materials was produced during the development of the Strategy. These included project updates, Frequently Asked Questions, an explainer video, climate adaptation-related resources, and a series of tailored fact sheets pertinent to coastal hazard adaptation.

The fact sheets include:

- Terminology
- Coastal Landscapes and Hazards
- Coastal Resilience and Adaptation
- Adaptation Framework
- Economics
- Strategy Summary

Outcomes

All input and feedback assisted in shaping the direction of technical investigations underpinning the Strategy and priority adaptation actions for Redlands Coast.

Additional outcomes include:

- A shared understanding of needs and opportunities in the adaptation planning process for Redlands Coast
- Appreciation of objectives for coastal management and preferred approaches to adaptation.

1.4 Strategy content

Council's Coastal Hazard Adaptation Strategy includes:

Section 2: An overview of landscape features, values, history, and critical elements of a resilient Redlands Coast.

Section 3: An overview of coastal hazards, including erosion and inundation, areas that may be exposed to coastal hazards, and the implications of exposure, including potential economic costs.

Section 4: Redland City Council's approach to adaptation, including a framework for shared responsibilities, adaptation responses, and options.

Section 5: Priority adaptation actions across the city.

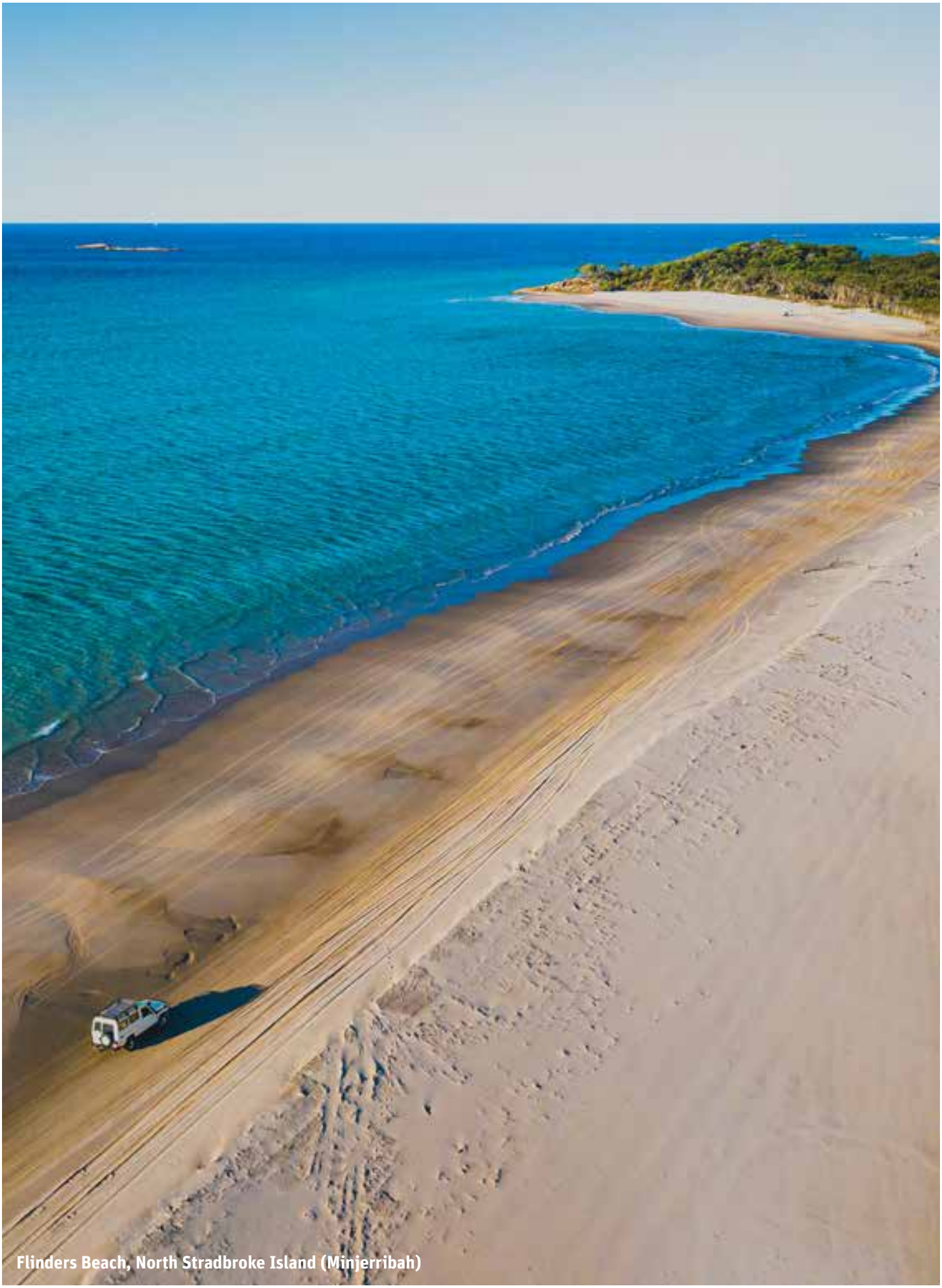
Section 6: Locality summaries with tailored adaptation actions for different communities.

Section 7: The approach to implementation, including adaptive management and change management planning.

The Strategy actions have been developed based on outcomes from the technical investigations and engagement undertaken over phases one to eight of the Strategy development process.



Raby Bay, Cleveland



Flinders Beach, North Stradbroke Island (Minjerribah)

2 Our Redlands Coast



Beach between groynes at Raby Bay Foreshore Park

Key environmental values include:

Coastal landforms – including the bay and intertidal areas, inlets and coastal plains, and sandy beach systems of Minjerribah

Vegetation communities and ecosystems – including the wetlands, seagrass, mangroves, and native dune vegetation

Significant and endangered species – including both land and marine wildlife (e.g. turtles, dugongs, birds, and fish).

2.1 Coastal landscape

Values

Redlands Coast is a key part of the traditional homeland of the Quandamooka People. Quandamooka means "people of the land and seas" and reflects the strong cultural ties to the landscape. The coastal landscape has high cultural significance for the Traditional Owners who value the protection and sustainability of the land and sea.

The coastal zone also has significant ecological value and includes Ramsar listed sites and parts of the Moreton Bay Marine Park. Moreton Bay (Mulgumpin) provides a habitat for a diverse range of unique plants, and animals including rare, vulnerable, and endangered species such as migratory shorebirds, frogs, dugongs, and turtles.

Well-known features of the Redlands Coast coastline include:

- The Ramsar listed Moreton Bay Marine Park, including the Geoff Skinner Wetlands Reserve
- Barrier dunes on the world's second-largest sand island, North Stradbroke Island (Minjerribah).

The coastal environment also holds significant lifestyle, recreational, commercial, and eco- and cultural tourism value. The region is renowned for scuba diving, boating, recreational and commercial fishing, and a diversity of active and passive recreational activities.

Economy

Redlands Coast has a diverse economy. The four largest sectors are health care and social assistance, construction, professional, scientific and technical services, and manufacturing. Together, these sectors contribute 40% of the total value-added economic activity in the LGA, which is slightly higher than the state average.

Moreton Bay (Mulgumpin) is Queensland's most important commercial fishery and provides significant economic value to Redlands Coast.

The city also attracts an average of more than 1 million local and international visitors per year, and the added value to the economy was $158.2 million in 2018/19[2]. Employment in the tourism industry is estimated at 1,382 full-time equivalent jobs. In 2018/19, most visitors to Redlands Coast were domestic overnight visitors (53.7%), followed by domestic daytrips (24.0%) and international visitors (22.3%).

While Redlands Coast's economy is generally well-diversified and resilient to disruption, the tourism industry and local businesses rely heavily on the coastal environment and coastal zones, and, therefore, may be vulnerable to coastal hazard events. Strategic planning and adaptation initiatives will assist in mitigating these potential impacts.

[2] Phase 7 summary report (RCC 2020b)

2.2 Towards resilience

Change, resilience and adaptation

One of the more challenging aspects of the coastal landscape is that it experiences constant and often rapid change.

Wind and waves continually work to move sediment and shape the shoreline, and extreme weather events can periodically result in substantial erosion and inundation of coastal land.

A resilient coast has social, economic, and environmental systems in place to avoid, manage, and mitigate the impact of hazardous events or disturbances (e.g. coastal hazards). Resilience also means the ability to respond or reorganise in ways that maintain the essential function, identity, and values of a region, while also being able to adapt to change.

For Redland City, coastal hazard adaptation options included in the Strategy are in accordance with the identity and values of our coastal communities.

The top three values of the coast identified during the consultation activities are:

- Natural ecosystem values
- Unique landscape and natural beauty
- Recreation and access.

There is a strong preference for nature-based options as the primary/initial pathway for coastal hazard adaptation.

Redlands Coast CHAS Survey June-July 2020

An online survey was available from June to July 2020 and received over 370 responses. The survey results have informed an understanding of key values and preferences for coastal hazard adaptation options. Highlights from the survey findings include:

Natural values of the landscape and access to the coast are key values. Over 80% of respondents noted the top values of the coast as natural ecosystem values, unique landscape and natural beauty (encompassing natural and cultural values), recreation and access.

There is strong community support for adaptation and planning. More than 75% of respondents support the need for proactive adaptation planning.

There is a significant preference for natural adaptation options. Over 70% of respondents have a preference for nature-based solutions for Redlands Coast in the future, including mangroves, dune protection, planning, and nourishment.



Wilson Esplanade, Victoria Point

3 Coastal hazards

3.1 Hazards

Coastal hazards include inundation of low-lying coastal land, and/or erosion of the shoreline.

Periodic inundation and erosion are natural processes and contribute to shaping the unique landforms of our coastal zone. However, when these processes have an adverse impact on communities, infrastructure and some natural assets, they are considered coastal hazards.

In southeast Queensland, major coastal hazard impacts are typically associated with East Coast Lows and occasional Tropical Cyclones.

3.2 Storm tide inundation

Storm tide inundation is the flooding of low-lying coastal land from a locally elevated sea level (the 'storm tide'). The storm tide is a combination of the predicted tide, storm surge, and wave action (Figure 3). Storm surge is driven by the combined influence of low atmospheric pressure and high winds associated with events such as Tropical Cyclones.

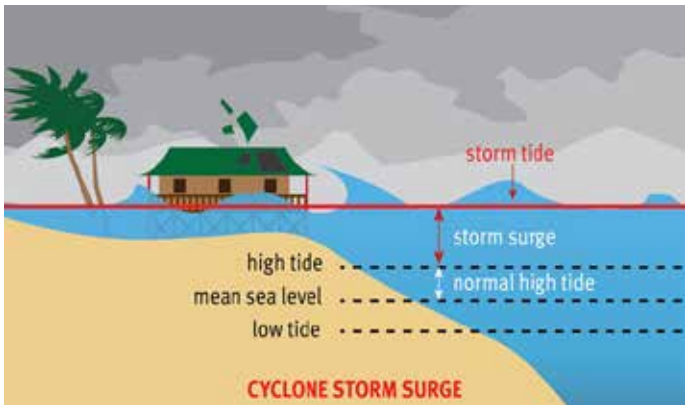


Figure 3. Components of storm tide

3.3 Coastal erosion

Coastlines naturally erode and accrete over time, driven by variations in sediment supply and climate patterns.

Short-term erosion

Coastal erosion occurs when winds, waves, and coastal currents act to shift sediment away from the shoreline. This can be a short-term shift, often associated with storm activity (termed storm bite), and the beach will then gradually rebuild (Figure 4).

When a beach is stable, all of the sand moved offshore during a storm eventually moves back onto the beach (over timeframes of months to years). In this case, periodic beach erosion does not result in a long-term landward movement of the shoreline.

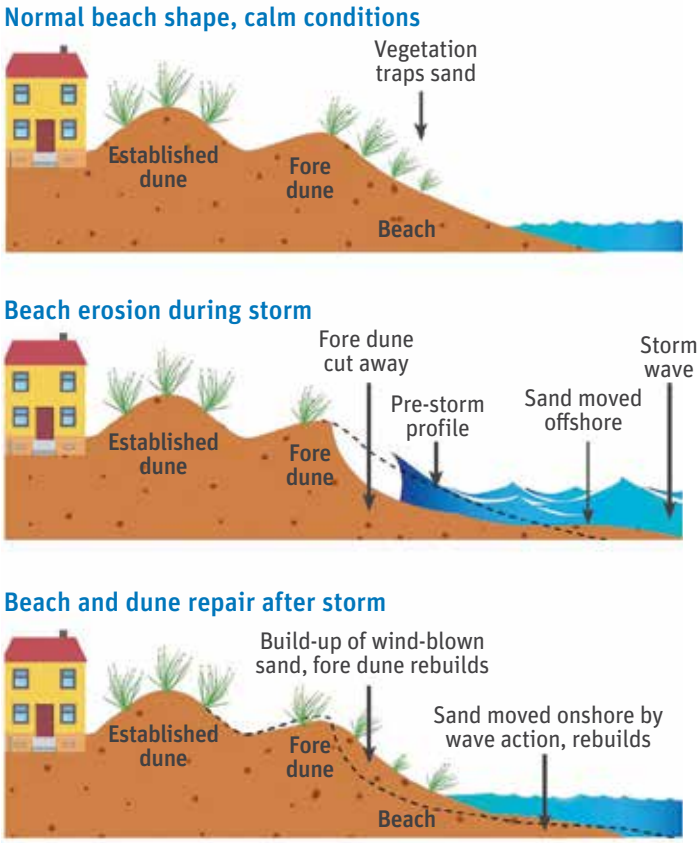


Figure 4. Natural short-term erosion and dune rebuilding process

Long-term erosion

In other cases, due to changing sediment supply or climate conditions, the beach may not have sufficient capacity to rebuild between storm events. In the absence of intervention, long-term erosion (termed recession) may occur, which is the landward movement of the shoreline over a longer timeframes.

Both short-term and long-term erosion processes may impact on coastal assets, depending on how close to the foredune assets are located.

3.4 Tidal inundation due to sea level rise

Tidal inundation is regular or permanent inundation from the tidal cycle, including up to the Highest Astronomical Tide. Areas of low-lying coastal land will be prone to an increased extent of tidal inundation with sea level rise. A 0.8m sea level rise by 2100 is currently planned for by the Queensland Government.

3.5 Current and future exposure

Redlands Coast is prone to storm events, and coastal hazard impacts are predicted to increase with a changing climate. A tailored approach to mapping coastal hazards for Redlands Coast has informed the Strategy development[3].

Storm tide inundation mapping

Storm tide mapping was produced in 2011 for Redland City Council, including planning horizons for 2016 and 2100 storm tide inundation. This was later revised in 2016 using an updated elevation model. In 2017, an intermediate, 2070 planning horizon, was also included.

The development of the Coastal Hazard Adaptation Strategy has utilised these existing 2016, 2070 and 2100 mapped hazard areas.

Erosion Prone Area (EPA) mapping

The Queensland Government define "Erosion Prone Areas" to the year 2100 as:

- Open coast erosion: A calculated component of open coast erosion potential, informed by erosion modelling
- Tidal zones: The combined area inundated by the Highest Astronomical Tide plus a defined horizontal buffer, plus any additional area inundated due to sea level rise.

The development of the Coastal Hazard Adaptation Strategy has included refinements to the Queensland Government's 2100 EPA mapping, as well as modelling of erosion for 2070 and present-day planning horizons.

As required by the Queensland Government, a sea level rise of 0.8m by 2100 has been adopted for the Coastal Hazard Adaptation Strategy (with 0.41m by 2070).

Event likelihood

Mapping for both erosion and storm tide inundation is based on a 1% Annual Exceedance Probability (AEP) event for all planning horizons (Table 1). Additional sensitivity analysis of more frequent AEPs was included to inform the assessment of adaptation options through the economic analysis.

Likelihood of occurrence	Hazard AEP	Planning horizons
Possible	1%	Present-day, 2070, 2100

Table 1. Likelihood of occurrence scenarios

Erosion Prone Areas and storm tide inundation indicate areas that may be exposed to erosion or inundation processes, now or in the future. They do not represent a predicted loss of coastal land. In many cases, hazard extents and impacts can be avoided, mitigated, or managed through adaptation planning.

Future coastal hazards

Projected sea level rise and an increase in cyclone intensity for the Queensland coastline is anticipated to increase the extent and impact of coastal hazards.

Coastal erosion:

- Increased water levels will accelerate coastal erosion
- Sediment transport patterns may be altered by shifts in wave direction, triggering changes to the form and location of shorelines
- Low-lying land may be permanently inundated
- Increased cyclone and storm activity will escalate the severity of coastal erosion events

Storm tide inundation:

- Sea level rise will increase the apparent severity and frequency of storm tide inundation and will cause inundation to occur further inland
- Increased cyclone and storm intensity will add to the magnitude of storm tide events and the extent of inundation

Source: Coastal Hazard Technical Guideline (DEHP 2013)

Hazard exposure

The mapped coastal hazard extents indicate areas and assets that may be exposed to different hazards now, and/or in the future.

For Redlands Coast, there is a range of land and asset types, as well as cultural resources that are likely to experience increased exposure to erosion and inundation by 2100. These include housing, commerce, recreation, health and safety, heritage, agriculture, land, transport, urban services, environment, and natural resources.[4]

The potential impact or consequence of exposure provides an appreciation of the relative risk of coastal hazards, as presented in the following section.

[3]Phase 3 Summary report (RCC 2019c)

[4]Phase 4 Summary report (RCC 2019d)

3.6 Land and assets at risk

Approach

Coastal hazards have the potential to have adverse impacts on Redlands Coast's coastal communities, services, and lifestyle, in both the present-day and by 2100.

As part of the Strategy development, new technical assessments were undertaken to review coastal hazard risk for a range of assets across the region[5].

The risk assessment includes an analysis of:

- Data on infrastructure assets (drainage, sewerage, water, roads, marine, beach, and foreshore)
- The Redland City Council planning scheme land parcels
- New information collated on dwellings (building locations, types)
- Environmental and land use overlays.
- Assets include tangible and intangible assets, as well as public and privately owned assets.

The risk is assessed against the likelihood of an asset being exposed to a coastal hazard, combined with the consequence of that exposure. The Redlands Coast tailored risk assessment for the 2070 and 2100 planning horizons considers:

- Exposure – realisation of the hazard event
- Sensitivities – inherent asset value impacted by exposure, design life and connectedness
- Potential impact – calculated by multiplying exposure and sensitivity; included connectedness for some calculations
- Vulnerability – assessed how much adaptive capacity and business-as-usual capacity would ameliorate the raw potential impact
- Value – environmental, social, and economic and governance support an asset provided to other assets.

Emerging risk profile

The present-day coastal hazard risk is relatively low for the majority of Redlands Coast. Less than 1% of residential, commercial, and community zoned areas are currently at risk from coastal hazards (Table 2). Around 5% of industrial areas and 8% of Indigenous places are at risk from storm tide inundation.

Coastal hazard risk increases notably into the future for some zones, with up to 4.4% of residential areas at risk by 2100 and a similar increase in the risk profile for commercial and community zoned areas and industrial areas.

Indigenous places have the highest increase in coastal hazard risk by 2100, with up to 31.9% of areas at risk from open coast erosion by 2100 and 14.7% of zones at risk from storm tide inundation.

	EPA			Storm tide (1% AEP)		
% planning scheme zone at risk from coastal hazards	**Present-day**	**2070**	**2100**	**Present-day**	**2070**	**2100**
Residential properties	-	1.2	2.1	0.7	2.4	4.4
Industrial buildings	-	6.6	6.9	4.1	6.3	8.4
Commercial buildings	-	1.6	2.0	0.5	2.1	3.9
Community buildings	-	0.4	0.8	0.4	1.2	1.7
Indigenous places	-	26.9	31.9	8.1	12.6	14.7

Table 2. Areas of planning scheme zones at risk

The risk assessment data has been used to inform the development of adaptation pathways for different locations along Redlands Coast. Data on individual asset risk will also be adopted into Council's asset management systems to inform renewal, upgrade, and betterment programs to improve asset resilience.


Aquatic Paradise East

[5]Phase 5 Summary report (RCC 2019e)



Aquatic Paradise Park West, Birkdale

Economic risk (base case)

In the absence of intervention or adaptation, there are economic costs associated with coastal hazards.

Economic analysis is critical for determining the best approach to coastal hazard adaptation for different localities. Economics is used in several ways, including:

- Value assets and key industries
- Define a base case (cost of no action)
- Assess adaptation options.

After assigning values to key infrastructure and natural assets[6], the foundational step of an economic assessment in coastal hazard adaptation is to define a base case (Figure 5). This means determining the potential economic costs or losses associated with coastal hazards (and no additional adaptation/intervention). This becomes the baseline for a cost-benefit assessment of implementing adaptation options.

The base case for the Strategy has been determined by examining the likelihood and consequence of coastal hazard impacts on assets and at different timeframes (e.g. present-day, 2070, and 2100).

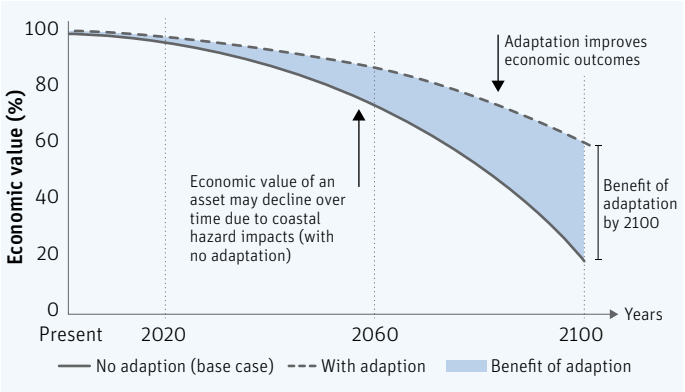


Figure 5. Economic base case and benefit of adaptation

Four key components of damages and losses have been considered for the base case:

1. **Damage to buildings and facilities –** Buildings and facilities include various public and private residences/buildings. This considers the financial cost of repairing or replacing assets.
2. **Damage to other infrastructure (Council-owned) –** These Council-owned assets include Council roads, car parks, pathways, flood mitigation and foreshore infrastructure, stormwater and waste infrastructure, and recreation facilities (e.g. golf courses and pools). This considers the financial cost of replacing these assets.
3. **Damage to infrastructure (non-Council-owned) –** These non-Council owned assets include road, water and rail transport infrastructure, electricity and other energy infrastructure, telecommunication infrastructure, emergency services infrastructure, and water and sewerage infrastructure. This considers the financial cost of repairing or replacing these assets.
4. **Land, environmental, and cultural asset damages –** Land, environmental, and cultural assets include land classifications such as wetlands, coastal forests, irrigated agriculture, and native grazing. Damage is estimated as the lost value from a reduction in the area and quality of these assets.

[6] Refer to Phase 7 Summary report (RCC 2019b)

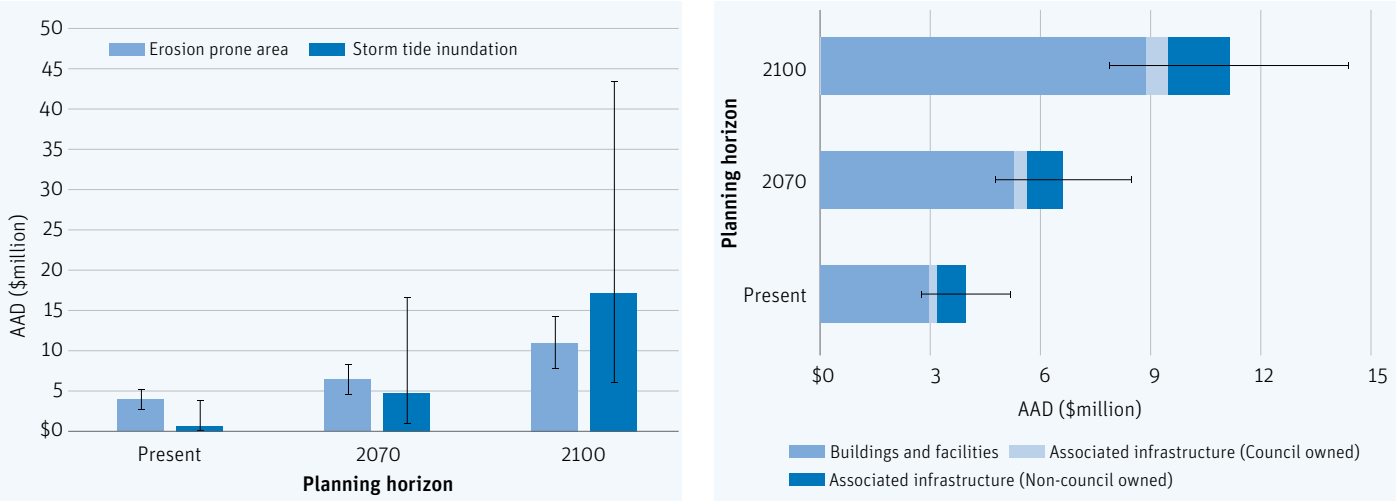


Figure 6. Potential average annual damages from coastal hazards for infrastructure assets (base case)

For Redlands Coast, the present-day average annual damages (AAD) associated with combined coastal hazard impacts on infrastructure assets are estimated to be in excess of $4 million (Figure 6). This is the average cost impact that could be expected to occur annually due to coastal hazards. This will vary from year to year, and link to weather events.

In the absence of adaptation, this is likely to increase to $11.5 million annually (AAD) by 2070 and over $28 million annually by 2100. The predicted increase in tidal zones linked to sea level rise is the main driver of the increase.

Losses of natural assets has also been considered in addition to infrastructure assets. Potential coastal hazard impacts for natural assets may be over $2.5 million annually (AAD) by 2100.

The estimated damages are largely linked to marsh/wetland, conservation and natural environments, predominantly around the Southern Moreton Bay Islands and North Stradbroke Island (Minjerribah).

Coastal hazards may also impact on cultural heritage assets. Should the underlying natural assets be damaged, these Indigenous values would be at risk.

Strategic adaptation can assist to avoid, mitigate and manage the impacts and potential economic damage associated with coastal hazards.

Implementing the adaptation approach and actions in the Coastal Hazard Adaptation Strategy will help avoid potential economic costs to Redland City of up to:

- Present-day: $4 million per annum
- By 2070: $11.5 million per annum
- By 2100: $30+ million per annum.


Sandboarding at North Stradbroke Island (Minjerribah)

4 Approach to adaptation

4.1 Framework

Council's role

Redland City Council recognises a shared responsibility for the management of coastal hazard risk; shared by all land managers, private landowners, and Council.

Council's primary responsibility is the maintenance and protection of Council land and assets, and to inform statutory planning. Council is not responsible for undertaking any foreshore protection works on privately-owned land across Redlands Coast.

Council's role in adaptation varies depending on the type and ownership of different assets (Table 3). Council's role includes to:

- **Inform –** Council will make available to all stakeholders (including public and private land and asset owners) the outcomes of relevant Council-led investigations on coastal hazard risk, planning, and adaptation options.
- **Observe –** Council will actively observe/monitor coastal hazard risk for Council owned land and assets. For land and assets owned or managed by others, Council may, as part of everyday activities, observe a risk from coastal hazards and will notify the relevant landowner/manager.
- **Plan –** Council will develop strategic planning measures to mitigate the risk of coastal hazard impacts on Council-owned land and assets, and to inform appropriate land use planning across the region.
- **Act –** Council will implement strategic planning measures to mitigate the risk of coastal hazard impacts on Council-owned land and assets, and to inform appropriate land use planning across the region.

Initiatives in the Coastal Hazard Adaptation Strategy also seek to foster and enable other stakeholders to proactively manage coastal hazard impacts on their own/land assets per the Strategy and in consultation with Council.

		Land or asset type		
		Council-owned	Managed by other authorities	Privately-owned
Council's role	Inform	✓	✓	✓
	Observe	✓	○	✗
	Plan	✓	✗	✗
	Act	✓	✗	✗

Table 3. Council's role in coastal hazard adaptation

A strategic approach

Across Australia and internationally, coastal land managers are taking a strategic approach to manage the risk of coastal hazards and enhance the resilience of our coastal zones.

Common elements of this strategic approach include:

- Assigning a strategic adaptation response to various localities to guide decision making with a pathways approach across present-day, intermediate, and 2100 planning horizons
- Assessing the range of adaptation options suitable in different locations to help avoid, mitigate, and manage the risk of coastal hazards
- Developing a strategy for coastal adaptation, with prioritised actions over a 5–10-year timeframe.

A tailored approach has been developed to guide decision making on adaptation response and options across Redlands Coast.



Cleveland Point

Adaptation objectives

The purpose of clarifying adaption objectives is to help guide an appropriate adaptation response and to screen adaptation options across different localities.

Objectives for Redlands Coast, as informed by consultation with stakeholders and the community, include:

- Retain the natural beauty of the coast
- Limit adverse impacts on scenic amenity
- Protect ecosystems
- Protect freshwater and tidal waterways and wetland habitats that support our unique and diverse wildlife such as dolphins, dugongs, and migratory shorebirds
- Minimise potential impacts on tourism
- Protect significant and vulnerable areas (environment and biodiversity)
- Retain sandy beaches
- Maintain access to the coast, including the beach, bay, and foreshore.

These objectives provide a reference for considering the suitability of different coastal hazard adaptation options across the coast.

Adaptation response

The tailored framework includes the following four adaptation responses: Avoid, Monitor, Maintain, and Prepare, Mitigate, and Transition, as outlined in Table 4.

Adaptation response	Coastal hazard adaptation		
Avoid Avoid placing new development or assets in coastal hazard areas	**Monitor, maintain, and prepare** Monitor the risk of coastal hazards. Monitor until local trigger levels are reached to initiate mitigation. + Maintain existing arrangements and prepare for future actions	**Mitigate** Actively mitigate the risk of coastal hazards through a range of additional adaptation options. Mitigate until local trigger levels are reached to initiate transition.	**Transition** A strategic decision to transition to an alternative land use in some areas. Mitigation may be part of the transition process.
Adaptation options	Full range of adaptation options		

Table 4. Adaptation response

Avoid

The first principle is to avoid placing new development or assets in coastal hazard areas. The preference is to ensure land use in coastal hazard areas is one that is low risk for coastal hazard impacts while also maximising economic, social, and environmental value to the region.

Any new development/infrastructure that is placed in coastal hazard areas will need to be in accordance with Queensland Government planning policy and approvals requirements and include necessary migration measures.

Monitor, maintain, and prepare

At localities where the coastal hazard risk profile is relatively low, Council will continue to monitor risk and undertake existing maintenance and asset management activities (including planned upgrades), planning and preparation for future mitigation works, and broader stewardship initiatives for the coastline. If over time, the risk profile is observed to increase (as indicated by local trigger levels), then the adaptation response may shift to mitigate.

Mitigate

At localities where coastal hazard risks have been identified, Council will actively manage the risk through implementing a range of adaptation options.

Mitigation will be tailored to each locality, incorporating site-specific processes, community input, and statutory planning considerations. If, over time, the risk profile is observed to increase (as indicated by local trigger levels), and mitigation becomes infeasible (due to economic or other factors), then the adaptation response may shift to transition.

Transition

In some specific areas within a locality, if the coastal hazard risk profile is very high, and/or mitigation becomes infeasible (due to economic or other factors), Council may make a strategic decision to transition to an alternative land use. Transition is likely to be a gradual process over time, where mitigating hazards for a period is part of the transition process.

Adaptation options

Four themes of adaptation options have been defined for the Strategy, with a range of options that relate to avoiding, mitigating, and managing the risk of coastal hazards. The themes include:

1. Enhancing adaptive capacity
2. Planning updates
3. Modifying infrastructure
4. Coastal management and engineering.

The adaptation options across these themes are described in Table 5. More detailed descriptions of the options are provided in the Adaptation Actions sheets available on Council's Your Say website.



Aquatic Paradise

Theme	Adaptation options	Description	Adaptation Actions sheet number
Initiatives to enhance adaptive capacity	Community stewardship	Developing programs and partnerships to enhance stewardship of the coastline	Sheet 1
	Knowledge sharing	Facilitating knowledge sharing and education on hazards and adaptation	Sheet 2
	Monitoring	Monitoring changes in coastal hazard risk and effectiveness of adaptation	Sheet 3
Planning	Land use planning	Informing statutory planning and other plans Includes consideration of land purchase or land swap/relocation	Sheet 4
	Disaster management	Updating emergency response planning	Sheet 4
Modifying infrastructure	Increase infrastructure resilience	• Modifying critical infrastructure (e.g. raising floor levels) • Modifying drainage networks • Building resilient homes	Sheet 5
	Relocate infrastructure	Relocating critical infrastructure	Sheet 5
Coastal management and engineering	Dune protection and maintenance	Minimising dune disturbance, maintaining vegetation	Sheet 6
	Beach nourishment	Providing additional sand to the beach (scraping and/or importing sand)	Sheet 7
	Structures to assist with sand retention	Using structures (groynes) to help retain sand	Sheet 8
	Structures to dissipate wave energy	Constructing offshore breakwaters or artificial reefs to dissipate wave energy (submerged or exposed)	Sheet 9
	Last line of defence structures	Constructing seawalls/revetment walls	Sheet 10
	Structures to minimise inundation	Constructing levees/dykes	Sheet 11

Table 5. Adaptation options by theme

4.2 Adaptation response by locality

An adaptation response has been assigned for key localities across Redlands Coast.

The adaptation response takes into consideration what is at risk, for example land and assets, and how the risk is changing over time – the emerging risk profile (present-day, 2070, and 2100)[8] (Table 6).

Mitigation is already ongoing at a number of locations, including on the Southern Moreton Bay Islands and North Stradbroke Island (Minjerribah), typically in response to shoreline erosion.

CHAS Zone	Present-day	2040	2070	2100
Thorneside	Mitigate			
Birkdale	Monitor, maintain, and prepare	Mitigate		
Wellington Point	Monitor, maintain, and prepare		Mitigate	
Ormiston	Monitor, maintain, and prepare		Mitigate	
Cleveland	Monitor, maintain, and prepare	Mitigate		
Thornlands	Monitor, maintain, and prepare			
Victoria Point	Monitor, maintain, and prepare	Mitigate		
Redland Bay	Monitor, maintain, and prepare	Mitigate		
Coochiemudlo Island	Monitor, maintain, and prepare		Mitigate	
Karragarra Island	Monitor, maintain, and prepare	Mitigate		
Lamb Island	Monitor, maintain, and prepare		Mitigate	
Macleay Island	Monitor, maintain, and prepare		Mitigate	
Russell Island	Monitor, maintain, and prepare	Mitigate		
Dunwich	Monitor, maintain, and prepare		Mitigate	
Amity Point	Mitigate			
Point Lookout	Monitor, maintain, and prepare			

*Note: Monitor, maintain, and prepare includes maintaining existing works and implementing actions already planned, and continuing to monitor the risk profile.

Table 5. Adaptation response for each locality

4.3 Determining adaptation actions

A range of actions has been defined to enable a strategic approach to coastal hazard adaptation across Redlands Coast. A suite of priority actions across the four themes (Table 7) have been defined at:

- The city-wide scale (outlined in Section 5)
- The locality scale as part of the adaptation response pathway (outlined in Section 6).

The priority actions were informed by initial screening of options, as well as a detailed cost-benefit analysis (CBA) for tailored coastal engineering options[9].

While there is not a strong economic case at present-day for investing in the majority of options considered, there are other drivers for considering the suitability of these options and willingness to invest. This includes broader strategic initiatives to maintain access and local uses and values. The economic case for investment does strengthen by 2070 and 2100.

Baseline actions of dune protection and maintenance, and mangrove protection and enhancement, will be critical for enhancing resilience, and there is benefit in commencing trials early to monitor effectiveness and update economic assessments accordingly in the future.

Actions across capacity building, land use planning, and commencing nature-based trials and adaptation options are the core focus for most localities, combined with some site-specific targeted investigations to inform future updates to the adaptation pathways.

Results may also change over time and should be the subject of future Strategy updates.

[8]As per technical investigations in the Phase 5, 6 and 7 summary reports (RCC 2019e, 2020a, 2020b)

[9]Refer Phase 7 summary report (RCC 2020b)

5 City-wide actions summary

The Coastal Hazard Adaptation Strategy priority actions across the region include actions relevant to the four themes identified for the Strategy:

1. Initiatives to enhance adaptive capacity
2. Planning
3. Modifying infrastructure
4. Coastal engineering and management

Priority city-wide 5–10-year actions for each of these themes are summarised in Table 7, with some additional information/guidance in the Adaptation Actions sheets available on Council's Your Say website.

Adaptation response and actions specific to different localities across the region are provided in the location summaries (Section 6).


South Gorge Beach, North Stradbroke Island (Minjerribah)

Theme	Strategic action no.	2020 Priority strategic actions (completed within 5–10 years)
1. Adaptive capacity initiatives	1.1 Coastal resilience stewardship program	1.1.1 Establish coastal resilience program and designated program officer role for the stewardship program and broader Coastal Hazard Adaptation Strategy implementation 1.1.2 Establish and implement the stewardship program, including coordination of location-based activities to enhance adaptive capacity. This includes environmental enhancement (vegetation - mangroves and dune systems), signage, and information (linked to actions 1.2, 1.3, 1.4 and locality based actions) 1.1.3 Investigate social vulnerabilities and adaptive capacity needs for the coast, and identify actions to enhance resilience in particular related to inundation hazards and access/services disruption 1.1.4 Seek co-funding/resources for further initiatives
	1.2 Knowledge sharing	1.2.1 Identify networks/forums for knowledge sharing (internal and external) 1.2.2 Generate communication materials (on Strategy implementation), including the role of mangrove and dune systems in mitigating coastal hazards, pilots of nature-based solutions, and resilient homes 1.2.3 Facilitate training/education workshops/events, focusing on nature-based solutions (mangroves, dunes, living shorelines), and resilient homes 1.2.4 Co-ordinate cross-agency information sharing 1.2.5 Create network of signage about coastal resilience at key locations (linked to action 1.1.2)
	1.3 Monitoring	1.3.1 Establish photo point monitoring system (coast snap or similar) at key locations (linked to locality based actions) 1.3.2 Create a platform/process for data management 1.3.3 Develop monitoring/evaluation metrics for implementation of actions, and effectiveness of actions, including focus on living shoreline effectiveness (also a potential student project) 1.3.4 Establish drone survey (elevation and aerial imagery) monitoring (every five – 10 years), or other tailored monitoring and reporting needed to inform adaptive management and the 10-year planning scheme review 1.3.5 Establish photo competition for high tide level monitoring and link into existing tidal morning data sets (link to 1.1.2)
	1.4 Research	1.4.1 Establish collaboration with key universities and research centres to progress suitable actions in the Strategy 1.4.2 Apply for collaborative government funding grants for relevant actions 1.4.3 Identify key pilot sites for nature-based solutions where research partnerships/collaborations may be feasible

Theme	Strategic action no.	2020 Priority strategic actions (completed within 5–10 years)
2. Planning	2.1 Land use planning	2.1.1 Formally adopt the Strategy to inform planning across Council 2.1.2 Investigate incorporating updated and refined Erosion Prone Area mapping into the Coastal Protection (Erosion Prone Areas) Overlay through a future amendment to the Redland City Plan 2.1.3 Review development outcomes in hazard areas to assess whether amendments are needed to overlay codes to ensure development accounts for predicted or emerging hazards and future planned infrastructure upgrades and mitigation works
	2.2 Disaster management	2.2.1 Use the updated Erosion Prone Area and storm tide mapping, risk assessment, and economic implications to update disaster management plans
3. Modifying infrastructure	3.1 Build resilience	3.1.1 Review at risk infrastructure and embed risk mitigation into current asset management plans. This could include 'betterment' at critical asset refurbishment/renewals points 3.1.2 Develop/update design guidelines for infrastructure (stormwater drainage assets, wastewater assets, water assets, waste assets, community and cultural assets, property assets, information and communication technology assets, roads, fleet assets, marine assets, parks and open space assets) 3.1.3 Promote resilient homes within the community and building sector (link in with action 1.2) 3.1.4 Review opportunities to improve drainage networks in locations where the risk of inundation for infrastructure is high (embedded within asset management plan) 3.1.5 Undertake more detailed risk assessments of specific assets that create 'pinch point' risk of failure of broader systems (infrastructure networks)
4. Coastal management and engineering	4.1 Environmental enhancement and living shorelines – pilot studies	4.1.1 Commence environmental enhancement program (vegetation, mangroves) at three pilot sites (linked to action 1.1.2 and location-based actions) 4.1.2 Pilot living shoreline establishment at two pilot sites (as per location-based actions) 4.1.3 Pilot dune protection and maintenance program at two pilot sites (linked to action 1.1.2) 4.1.4 Extend the environmental enhancement and maintenance programs to all relevant areas (linked to outcomes of 1.3)
	4.2 Additional shoreline erosion mitigation actions	4.2.1 Implement Shoreline Erosion Management Plan (SEMP) for Amity Point and Coochiemudlo Island 4.2.2 Implement planned works incorporated into present-day capital work planning and embedded in adaptation pathways for relevant locations 4.2.3 Clarify Council perspectives and potential funding models/mechanisms for open coast erosion mitigation works that have differing levels of private and public benefit. Establish a more formal policy on co-funding where applicable (e.g. a special levy) 4.2.4 Review and update the CBA and associated adaptation pathway options every 10 years for open coast erosion mitigation works (in combination with review of the Strategy, and linked to outcomes of 1.3 and 4.1)
	4.3 Additional inundation mitigation actions	4.3.1 Investigate the concept design of works to provide increased protection from tidal area expansion and storm tide inundation for the Raby Bay canal estate. Establish indicative costings to inform any 'betterment' opportunities that arise from disaster relief funding following actual events 4.3.2 Review and update the CBA and associated adaptation pathway options every 10 years for works to mitigate inundation (in combination with review of the Strategy) – linked to outcomes of action 2.1.5

Table 7. City-wide actions

6 Location summaries

Adaptation pathways for Redland City Council suburbs are summarised over the following pages.

In addition to applying the city-wide actions, the location-based pathways include:

- Two focus sites for environmental stewardship activities - to enhance vegetation and mangroves, and monitor the effectiveness of these actions for mitigating coastal hazard risk
- Two trial sites for the design and establishment of living shorelines, using combined vegetation and minor structural protection works and monitoring the effectiveness of this approach for mitigating coastal hazard risk
- Maintenance and upgrades for existing shoreline protection works and new works for relevant locations
- Reviewing the effectiveness of adaptation actions and hazard mitigation works and using this information to inform updates to the long-term adaptation pathway



Southern Moreton Bay Islands

Thorneside

Thorneside is located at the northern end of the Redlands Coast coastal zone, and it is bounded by Tingalpa Creek to the northwest (Figure 7).

Low-lying areas adjacent to the river frontage and bay foreshore may be increasingly exposed to storm tide inundation and expanding tidal areas in the future.

Existing areas of mangroves are protecting adjacent land and assets from erosion and inundation hazards. Sections of the bayside shoreline have additional protection measures, including seawalls (rock and geotextile).

The present-day adaptation response for Thorneside is to mitigate coastal hazard risk, and continue mitigation actions into the future.

The adaptation pathway includes a focus on environmental enhancement, upgrading and extending existing seawall protection works, and reviewing the adaptation pathway over time, and considering future alternatives (Table 8). City-wide actions also apply where relevant to this locality.



Figure 7. Thorneside

	Present-day	By 2040	By 2070	By 2100
THORNESIDE	Mitigate			
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable Review and investigate planning measures for long-term inundation hazard mitigation in developed areas			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Complete concept designs and approvals and implement upgrade for Queens Esplanade seawall – replacement and extension of existing geo-bag seawall	Maintain shoreline protection works	Review adaptation pathway options Undertake concept planning for additional structural protection or upgrades with reference to planning directions: may include seawall upgrades/possible levee/road and services raising	Implement additional structural protection/ upgrades or alternative adaptation actions
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway.			

Table 8. Thorneside adaptation pathway

Birkdale

Birkdale is located towards the northern end of the Redlands Coast coastal zone, and includes the bayside areas either side of the Tarradarrapin Creek estuary mouth, and estuarine areas to the south west along Tingalapa Creek (Figure 8).

Low-lying areas adjacent to the bay foreshore, the canal estates, and creek river frontage may be increasingly exposed to storm tide inundation and expanding tidal areas in the future.

Existing areas of mangroves are protecting adjacent land and assets from erosion and inundation hazards. The majority of the bayside shoreline has additional protection measures, including seawalls and revetments along the bay frontage and the canal estates.

The present-day adaptation response for Birkdale is to continue to monitor coastal hazard risk (and maintain existing arrangements), and begin preparations for additional hazard mitigation in the future.

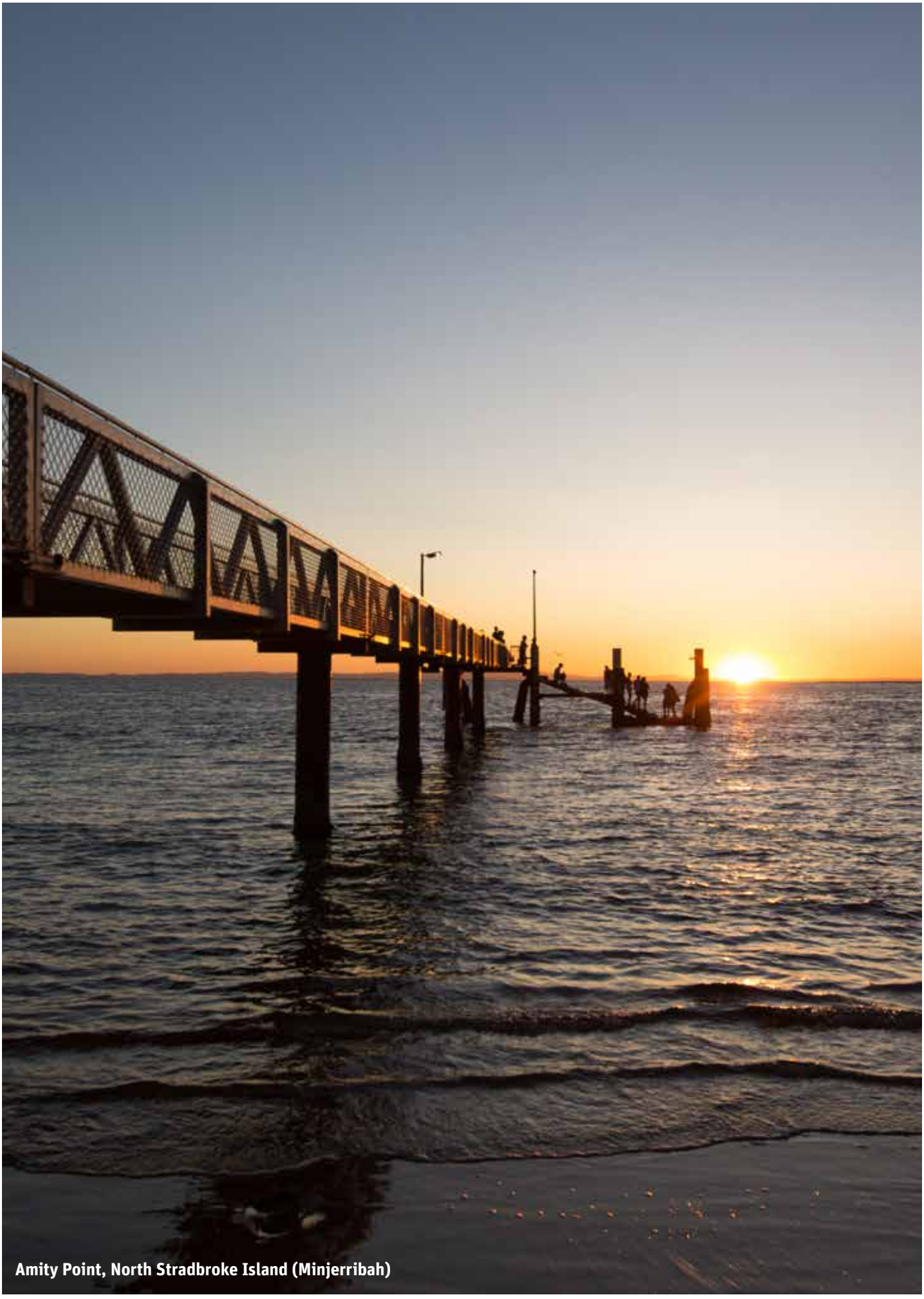
The adaptation pathway includes a focus on maintaining existing shoreline protection works, trialling a living shoreline design, and reviewing the adaptation pathway over time, and considering future alternatives (Table 9). City-wide actions also apply where relevant to this locality.



Figure 8. Birkdale

	Present-day	By 2040	By 2070	By 2100
BIRKDALE	Monitor, maintain, and prepare	Mitigate		
Enhance adaptive capacity	As per city-wide actions as applicable, including: • Establish Aquatic Paradise Park (east) or Three Paddocks Park as a focus site for action 1.2.5 - enhance signage on hazards and role of vegetation • Establish Aquatic Paradise Park (east) or Three Paddocks Park as a key site for action 1.3.1 - a photo monitoring station (Coast snap to similar) to monitor potential living shoreline site, and potential research collaboration – action 1.4.1			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Maintain existing shoreline protection works and integrate into living shoreline design Develop concept design and monitoring plan for living shoreline at Aquatic Paradise Park (east) or Three Paddocks Park (link to action 4.1.2 and 1.3.3)	Implement living shoreline design	Review of effectiveness of living shoreline design Review pathway options Concept planning for additional structural protection or upgrades (if applicable)	Review of effectiveness of living shoreline design Review pathway options Implement additional structural protection or upgrades (if applicable) Undertake feasibility study for potential tidal barrier for canal estate
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Living shoreline does not achieve expected level of service → Pathway is reviewed and planning for additional works may commence • Water levels at canal estate are too high too often by 2100 → Feasibility is reviewed for a tidal barrier for canal estate			

Table 9. Birkdale adaptation pathway



Amity Point, North Stradbroke Island (Minjerribah)

Wellington Point

Wellington Point extends from Three Paddocks Park in the west to Hilliards Creek to the south and includes the bayside frontage around Wellington Point and extensive estuarine and wetland areas to the southeast (Figure 9).

The point is at a higher elevation than adjacent areas, however low-lying areas on the west side of the point, and creek frontage to the south east, may be increasingly exposed to storm tide inundation and expanding tidal areas in the future.

Existing areas of mangroves are protecting adjacent land and assets from erosion and inundation hazards. Limited sections of the shoreline have additional protection measures, including seawalls and revetments.

The present-day adaptation response for Wellington Point is to continue to monitor coastal hazard risk, and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on maintenance of existing coastal shoreline works, and reviewing the adaptation pathway over time and considering future alternatives, including beach nourishment at the reserve, and new protection works for critical assets (Table 10). City-wide actions also apply where relevant to this locality.



Figure 9. Wellington Point



Foreshore area at Wellington Point

	Present-day	By 2040	By 2070	By 2100
WELLINGTON POINT	Monitor, maintain, and prepare		Mitigate	
Enhance adaptive capacity	As per city-wide actions as applicable, including: Establish Wellington Point Recreation Reserve as a key site for action 1.3.1 - a photo monitoring station (CoastSnap or similar)			
Planning	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Modifying infrastructure	As per city-wide actions as applicable			
Coastal engineering and management	Maintain existing shoreline protection works Develop concept design and approvals (with triggers) for the western end of the Wellington Point Recreation Reserve beach (Champion Lane) Establish monitoring site for beach dynamics at Wellington Point Recreation Reserve beach (linked action 1.3.1) Confirm approach to providing technical support/ guidance to private owners to self-manage private seawalls	Maintain existing shoreline protection works Review erosion risk to causeways and develop concept design for additional protection works (if applicable) Review beach dynamics/ erosion rate of change at Wellington Point Recreation Reserve. Develop concept design for beach nourishment program (if feasible) Provide technical support/ guidance to private owners to self-manage private seawalls	Maintain and upgrade existing shoreline protection works – including a review of seawall heights (raised or wave barrier added) Review pathway options Implement new seawalls at the Wellington Point Recreation Reserve beach Implement beach nourishment at Wellington Point Recreation Reserve (if triggered) Prepare concept design and approvals for additional hazard mitigation works (seawall or other) including for Main Road, Wellington Point, and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Nourishment program and/or additional mitigation works may commence			

Table 10. Wellington Point adaptation pathway

Ormiston

Ormiston is situated in the central part of the Redlands Coast mainland, bounded by Hilliards Creek to the west (Figure 10).

Existing areas of mangroves span the majority of the coastal and estuarine frontage, and are protecting adjacent land and assets from erosion and inundation hazards.

Only a limited extent of low-lying area around the estuarine and bayside frontage is likely to be exposed to storm tide inundation and expanding tidal areas in the future. Limited sections of the shoreline have additional protection measures, including seawalls and revetments.

The present-day adaptation response for Ormiston is to continue to monitor coastal hazard risk, and begin preparations for additional hazard mitigation in the longer term.

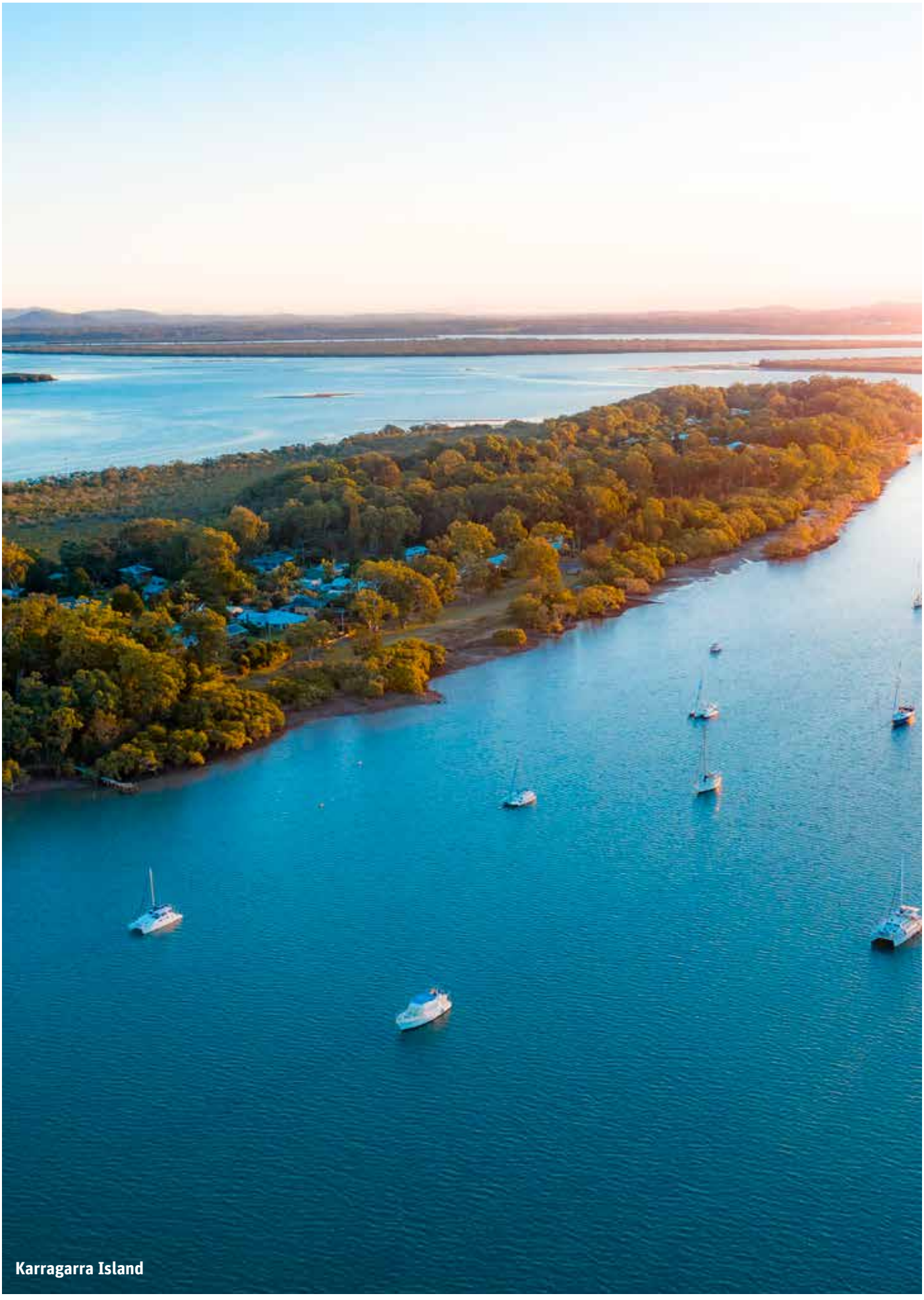
The adaptation pathway includes a focus on protecting the existing natural coastal hazard defences (mangroves and vegetation), maintaining existing coastal protection structures, and reviewing the adaptation pathway over time, and considering future alternatives (Table 11). City-wide actions also apply where relevant to this locality.



Figure 10. Ormiston

	Present-day	By 2040	By 2070	By 2100
ORMISTON	Monitor, maintain, and prepare		Mitigate	
Enhance adaptive capacity	As per city-wide actions as applicable, including: Establish Raby Esplanade Park as a focus site for action 1.2.5 - enhance signage on hazards and role of vegetation			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Maintain existing shoreline protection works and monitor effectiveness	Review effectiveness of existing shoreline protection works Prepare concept design and approvals for upgrade of existing shoreline protection works (seawalls), including seawall upgrade at Sleath Street	Review pathway options Implement upgrade to existing shoreline protection works (if triggered) Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (seawall or other) if applicable, and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession or exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Planning and implementation of additional mitigation works or alternatives may commence			

Table 11. Ormiston adaptation pathway



Karragarra Island

Cleveland

Cleveland is situated in the central part of the Redlands Coast mainland, including the canal estates of Raby Bay, Cleveland Point, and the bayside frontage extending south (Figure 11).

Existing areas of mangroves along the bay frontage south of Cleveland Point are protecting adjacent land and assets from erosion and inundation hazards. The canal estates and Cleveland Point waterfront areas have extensive shoreline infrastructure protection, including seawalls, revetments, and groynes.

Low-lying areas including Raby Bay and bayside frontage to the south are likely to be exposed to storm tide inundation and expanding tidal areas in the future.

The present-day adaptation response for Cleveland is to continue to monitor coastal hazard risk, and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on maintenance of existing shoreline protection works, trialling a living shoreline design, and reviewing the pathway over time and considering future alternatives including new protection works for critical assets (Table 12). City-wide actions also apply where relevant to this locality.



Figure 11. Cleveland



Cleveland Point

	Present-day	By 2040	By 2070	By 2100
CLEVELAND	Monitor, maintain, and prepare	Mitigate		
Enhance adaptive capacity	As per city-wide actions as applicable, including: • Establish Oyster Point Park as a focus site for action 1.2.5 - enhance signage on hazards and role of mangroves and vegetation • Establish Oyster Point Park as a focus site for action 1.3.1 - a photo monitoring station (CoastSnap to similar) to monitor potential living shoreline site, and potential research collaboration – action 1.4.1			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3 Undertake a feasibility study on elevating Shore St North			
Coastal engineering and management	Maintain existing shoreline protection works Develop concept design and monitoring plan for living shoreline at Oyster Point Park (link to action 4.1.2 and 1.3.3) Confirm approach to providing technical support/ guidance to private owners to self-manage private seawalls	Maintain existing shoreline protection works Implement living shoreline design Provide technical guidance to owners of private seawalls	Maintain and upgrade existing protection works Review of effectiveness of living shoreline design Review pathway options Prepare concept design and approvals for upgrades and/ or additional hazard mitigation works (if applicable), and implement (if triggered), including for Cleveland Point and Raby Bay bayside Undertake feasibility study (if applicable) for potential tidal barrier for canal estates at Raby Bay, Columbus Canal and Ross Creek	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Living shoreline does not achieve expected level of service → Pathway is reviewed and planning for additional works may commence • Water levels at canal estate are too high too often by 2100 → Feasibility is reviewed for a tidal barrier for canal estate			

Table 12. Cleveland adaptation pathway

Thornlands

Thornlands extends south of Cleveland to Eprapah Creek (Figure 12).

Existing areas of mangroves along the bay frontage are protecting adjacent land and assets from erosion and inundation hazards.

Low-lying areas are likely to be exposed to storm tide inundation and expanding tidal areas in the future. However, very limited public or private assets are expected to be impacted.

The adaptation response for Thornlands is to continue to monitor coastal hazard risk. The adaptation pathway includes a focus on protecting existing natural coastal hazard defences (mangroves and vegetation) and reviewing the adaptation pathway over time (Table 13). City-wide actions also apply where relevant to this locality.



Figure 12. Thornlands

	Present-day	By 2040	By 2070	By 2100
THORNLANDS	Monitor, maintain, and prepare			
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning updates	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable			
Coastal engineering and management	Maintain existing arrangements and monitor	Review effectiveness of existing arrangements		
Other considerations	Establish indicators to monitor level of acceptable service and trigger change of pathway Examples include: • Mangroves and shoreline vegetation is unstable/condition declining and/or risk exposure is increasing → Pathway reviewed			

Table 13. Thornlands adaptation pathway

Victoria Point

Victoria Point is bounded by Epapah Creek in the north and Moogurrapum Creek to the south (Figure 13).

Existing areas of mangroves along the creek frontage and limited areas of the bayside frontage are protecting adjacent land and assets from erosion and inundation hazards. The majority of the bayside shoreline has additional protection measures including seawalls (rock and geotextile).

Low-lying areas adjacent to the river frontage and bay foreshore may be increasingly exposed to storm tide inundation and expanding tidal areas in the future.

The present-day adaptation response for Victoria Point is to continue to monitor coastal hazard risk, and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on maintaining existing shoreline protection works, implementing new works, and reviewing the adaptation pathway over time and considering future alternatives (Table 14). City-wide actions also apply where relevant to this locality.



Figure 13. Victoria Point

	Present-day	By 2040	By 2070	By 2100
VICTORIA POINT	Monitor, maintain, and prepare	Mitigate		
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3 Develop concept design for Victoria Point Waste Water Treatment Plan protection (possible levee or alternative required) and implementation (when triggered)			
Coastal engineering and management	Maintain existing shoreline protection works Develop concept designs and approvals for beach nourishment and rock groynes at Wilson Esplanade (Wilson Street to Barron Street) Develop concept designs and approvals for seawall at Wilson Esplanade (Barron Street to Les Moore Park) Confirm approach to providing technical support/ guidance to private owners to self-manage private seawalls	Maintain existing shoreline protection works Implement beach nourishment and groyne construction (Wilson Street to Barron Street) Implement seawall construction (Barron Street to Les Moore Park) (when triggered) Provide technical support/ guidance to private owners to self-manage private seawalls	Review pathway options Prepare concept design and approvals for upgrades and/ or additional hazard mitigation works (if applicable), and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway. Examples include: • Rate of shoreline recession exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Nourishment program and/or additional mitigation works may commence			

Table 14. Victoria Point adaptation pathway

Redland Bay

Redland Bay is located at the southern end of the Redlands Coast mainland, extending from Moogurrapum Creek to the north to the Logan River to the south (Figure 14).

Existing areas of mangroves along the creek and bayside frontage are protecting adjacent land and assets from erosion and inundation hazards. Sections of the bayside shoreline have additional protection measures, including seawalls and revetments.

Low-lying areas adjacent to the creek frontage and bay foreshore may be increasingly exposed to storm tide inundation and expanding tidal areas in the future.

The present-day adaptation response for Redland Bay is to continue to monitor coastal hazard risk, and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on environmental stewardship, maintaining and upgrading existing shoreline protection works and preparation for new works, and reviewing the adaptation pathway over time and considering future alternatives (Table 15). City-wide actions also apply where relevant to this locality.



Figure 14. Redland Bay



Foreshore area at Redland Bay

	Present-day	By 2040	By 2070	By 2100
REDLAND BAY	Monitor, maintain, and prepare	Mitigate		
Enhance adaptive capacity	As per city-wide actions as applicable, including: • Establish Sel Outridge Park as a focus site for action 1.1.2 - environmental enhancement stewardship • Establish Sel Outridge Park as a focus site for action 1.2.5 - enhance signage on hazards and role of mangroves and vegetation			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Maintain existing shoreline protection works Establish environmental enhancement trial site and monitoring program at Sel Outridge Park (link to action 4.1.1), and develop concept design for vegetation enhancement Investigate foreshore protection management options for the foreshore from Bay Street to Boundary Street Confirm approach to providing technical support/ guidance to private owners to self-manage private seawalls	Maintain existing shoreline protection works Implement vegetation management concept design for Sel Outridge Park Implement foreshore protection management option/s - Bay Street to Boundary Street (if triggered) Undertake a feasibility study for a seawall upgrade north and south of Weinam Creek, and Talburpin Point Provide technical support/ guidance to private owners to self-manage private seawalls	Review effectiveness of environmental enhancement trials Review pathway options Prepare concept design and approvals for upgrades and/ or additional hazard mitigation works or upgrades – living shoreline, seawall or other if applicable, and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Environmental enhancement does not achieve expected level of service, rate of shoreline recession or exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Planning for additional mitigation works or alternatives may commence			

Table 15. Redland Bay adaptation pathway

Coochiemudlo Island

Coochiemudlo Island is a bay island situated off the central Redlands Coast mainland (Figure 15).

The east and southern coastline is predominantly open sandy shorelines, and extensive mangrove communities span the western shoreline.

The sandy coastline is prone to open coast erosion processes and a Shoreline Erosion Management Plan has recently been developed to mitigate erosion risk. Limited low-lying areas of the island may also be increasingly exposed to storm tide inundation and expanding tidal areas in the future.

The present-day adaptation response for Coochiemudlo Island is to continue to monitor coastal hazard risk, and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on implementing the Shoreline Erosion Management Plan and reviewing the adaptation pathway over time and considering future alternatives (Table 16). City-wide actions also apply where relevant to this locality.



Figure 15. Coochiemudlo Island

	Present-day	By 2040	By 2070	By 2100
COOCHIEMUDLO ISLAND	Monitor, maintain, and prepare		Mitigate	
Enhance adaptive capacity	As per city-wide actions as applicable, including: • Establish Norfolk Beach as a focus site for action 1.1.2 – environmental stewardship (dune protection and enhancement)			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3		Undertake feasibility study for raising Victoria Parade South or alternative adaptation options, and implementation triggers	
Coastal engineering and management	Implement Shoreline Erosion Management Plan Develop concept plan for dune protection and enhancement activities, and implement (focus on trial site at Norfolk Beach)	Review and update Shoreline Erosion Management Plan Undertake a beach and dune nourishment feasibility study at Victoria Parade East and other relevant locations	Review pathway options Implement beach nourishment (if triggered) Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (if applicable), and implement (if triggered), including potential seawalls at Victoria Parade East and Main Beach	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession exceeds defined point → Nourishment program or alternative works commence			

Table 16. Coochiemudlo Island adaptation pathway

Karragarra Island

Karragarra Island is a bay island situated off the southern Redlands Coast mainland (Figure 16).

Vegetation, including mangroves, spans several areas of the shoreline, and pockets of sandy beaches, are present at the northwest end of the island.

The open coast and limited low-lying areas (mainly the central parts of the island) are likely to be increasingly exposed to erosion and inundation into the future.

The present-day adaptation response for Karragarra Island is to continue to monitor coastal hazard risk and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes maintaining arrangements, preparations for potential new shoreline protection works, and reviewing the adaptation pathway over time, and considering future alternatives including, infrastructure protection works in the long term (Table 17). City-wide actions also apply where relevant to this locality.



Figure 16. Karragarra Island

	Present-day	By 2040	By 2070	By 2100
KARRAGARRA ISLAND	Monitor, maintain, and prepare	Mitigate		
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Maintain existing arrangements and monitor effectiveness Prepare concept design and approvals for foreshore protection management option/s at The Esplanade east of the ferry terminal, including triggers for implementation	Maintain existing arrangements and monitor effectiveness Implement foreshore protection management option/s if triggered Feasibility study for additional structural protection works for The Esplanade – Maryanne St	Review pathway options Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (if applicable), and implement (if triggered), including for The Esplanade – Maryanne St, and south side of the Island	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession or exceeds defined point → Planning and implementation of additional mitigation works or alternatives may commence			

Table 17. Karragarra Island adaptation pathway

Lamb Island

Lamb Island is a bay island situated off the southern Redlands Coast mainland, separated from MacLeay Island by a narrow canal (Figure 17).

Vegetation, including mangroves, spans several areas of the shoreline. Limited low-lying areas (mainly the northern parts of the island) are likely to be increasingly exposed to erosion and inundation into the future.

The present-day adaptation response for Lamb Island is to continue to monitor coastal hazard risk and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes scoping of additional shoreline protection works, reviewing the adaptation pathway over time, and considering future alternatives (Table 18). City-wide actions also apply where relevant to this locality.



Figure 17. Lamb Island

	Present-day	By 2040	By 2070	By 2100
LAMB ISLAND	Monitor, maintain, and prepare		Mitigate	
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Maintain existing arrangements and monitor effectiveness	Maintain existing arrangements and monitor effectiveness Feasibility/scoping study for additional structural protection works for critical assets/key access roads	Review pathway options Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (if applicable), and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession or exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Planning and implementation of additional mitigation works or alternatives may commence			

Table 18. Lamb Island adaptation pathway

Macleay Island

Macleay Island is one of the larger inner-bay islands situated off the southern end of the Redlands Coast mainland (Figure 18).

Vegetation, including mangroves, spans several areas of the shoreline, interspersed with limited pockets of sandy beaches. There are localised areas with additional shoreline infrastructure protection, such as seawalls.

Limited low-lying areas of the island are likely to be increasingly exposed to erosion and inundation into the future.

The present-day adaptation response for Macleay Island is to continue to monitor coastal hazard risk and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes scoping of additional shoreline protection works, reviewing the adaptation pathway over time, and considering future alternatives (Table 19). City-wide actions also apply where relevant to this locality.



Figure 18. Macleay Island

	Present-day	By 2040	By 2070	By 2100
MACLEAY ISLAND	Monitor, maintain, and prepare		Mitigate	
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3		Undertake feasibility/concept design (and implementation if triggered) to raise road level at Pine Gate Place and Calm Water Crescent; maintain access to Perulpa Island	
Coastal engineering and management	Maintain existing arrangements and monitor effectiveness	Maintain existing arrangements and monitor effectiveness Develop scope for a site management plan to mitigate erosion and storm tide inundation at Sand Piper beach, with a focus on revegetation Undertake feasibility/ scoping study for additional structural protection works for critical assets/key access roads	Review pathway options Implement site management plan for Sand Piper beach (if triggered) Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (if applicable), including for key access roads, and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession or exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Planning and implementation of additional mitigation works or alternatives may commence			

Table 19. Macleay Island adaptation pathway

Russell Island

Russell Island is the largest of the inner-bay islands situated toward the southern extent of the Redland City LGA (Figure 19).

Vegetation, including mangroves, spans several areas of the shoreline. There are localised areas with additional shoreline infrastructure protection (seawalls).

Low-lying areas of the island, particularly the southern areas of the island, are likely to be increasingly exposed to erosion and inundation into the future.

The present-day adaptation response for Russell Island is to continue to monitor coastal hazard risk and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on environmental stewardship, maintaining existing shoreline protection works and preparation for new works, and reviewing the adaptation pathway over time and considering future alternatives (Table 20). City-wide actions also apply where relevant to this locality.

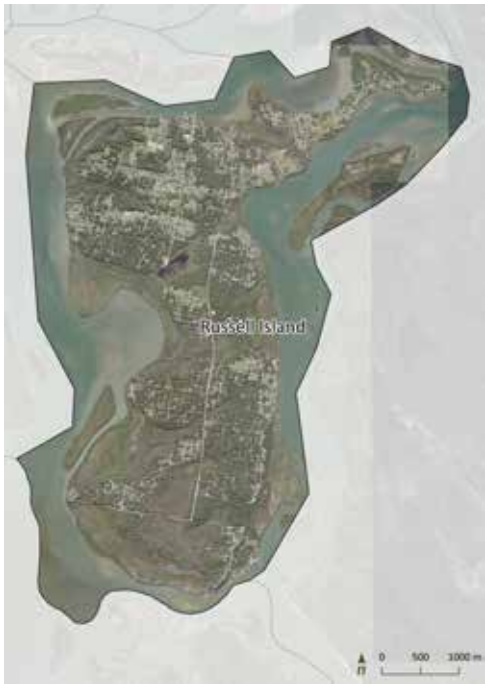


Figure 19. Russell Island



Jock Kennedy Park, Russell Island

	Present-day	By 2040	By 2070	By 2100
RUSSELL ISLAND	Monitor, maintain, and prepare	Mitigate		
Enhance adaptive capacity	As per city-wide actions as applicable, including: • Establish The Boulevard (south east of the island) as a focus site for action 1.1.2 - environmental enhancement stewardship • Establish The Boulevard (south east of the island) as a focus site for action 1.2.5 - enhance signage on hazards and role of mangroves and vegetation			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3		Undertake feasibility/concept design (and implementation if triggered) to raise roads, as required	
Coastal engineering and management	Maintain existing shoreline protection works Establish environmental enhancement trial site and monitoring program at The Boulevard (link to action 4.1.1), and develop concept design for vegetation enhancement Finalise concept design and approvals for planned seawalls at Rocky Point Park (Glendale Road) Confirm approach to providing technical support/ guidance to private owners to self-manage private seawalls	Maintain existing shoreline protection works Implement vegetation management concept design for The Boulevard Implement planned seawalls (when triggered) for Rocky Point Park Undertake concept design for coastal protection (seawalls) at Russell Island Ferry Terminal (east and west) Provide technical support/ guidance to private owners to self-manage private seawalls	Review effectiveness of environmental enhancement trials. Review pathway options Implement protection works (if triggered) for Russell Island Ferry Terminal (east and west) Prepare concept design and approvals for upgrades and/ or additional shoreline protection works – living shoreline, seawall or other if applicable, and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Environmental enhancement does not achieve expected level of service, rate of shoreline recession or exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Planning for additional mitigation works or alternatives may commence			

Table 20. Russell Island adaptation pathway

Dunwich

Dunwich is a small suburb located on the west side of North Stradbroke Island (Minjerribah), where the island's main ferry terminal is located (Figure 20).

The shoreline includes sandy beaches, vegetated areas, and open space with infrastructure services. There are several areas with existing shoreline infrastructure protection (seawalls/revetments).

Sandy sections of the coastline are likely to be increasingly prone to erosion in the future. Limited low-lying areas, particularly in the north around Bradbury's Beach, are likely to be increasingly exposed to storm tide inundation.

The present-day adaptation response for Dunwich is to continue to monitor coastal hazard risk and begin preparations for additional hazard mitigation in the future.

The adaptation pathway includes a focus on maintaining existing arrangements, monitoring effectiveness, and reviewing the adaptation pathway over time and considering future alternatives, including shoreline protection works in the long term (Table 21). City-wide actions also apply where relevant to this locality.



Figure 20. Dunwich

	Present-day	By 2040	By 2070	By 2100
DUNWICH	Monitor, maintain, and prepare		Mitigate	
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Maintain existing arrangements and monitor effectiveness	Maintain existing arrangements and monitor effectiveness	Review pathway options Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (if applicable), and implement (if triggered)	
Other considerations	Establish indicators (with concept designs) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession or exceeds defined point, or effectiveness of existing works is below required levels of service or beyond design life → Planning and implementation of additional mitigation works or alternatives may commence			

Table 21. Dunwich adaptation pathway



Dunwich, North Stradbroke Island (Minjerribah)

Amity Point

Amity Point is a small suburb on the northwest tip of North Stradbroke Island (Minjerribah), facing the South Passage, a very dynamic channel separating Moreton Island (Mulgumpin) and North Stradbroke Island (Minjerribah) (Figure 21).

The majority of the shoreline has existing formal or informal structural protection works, including seawalls, flow-slide structures, revetments and groynes.

A Shoreline Erosion Management Plan has been recently adopted to provide a coordinated approach to mitigating ongoing erosion challenges. Limited low-lying areas may also be increasingly prone to storm tide inundation in the future.

The present-day adaptation response for Amity Point is to continue to mitigate coastal hazard risk, and begin preparations for additional hazard mitigation in the longer term.

The adaptation pathway includes a focus on Shoreline Erosion Management Plan implementation, and reviewing the adaptation pathway over time, and considering future alternatives, including infrastructure protection works in the long term (Table 22). City-wide actions also apply where relevant to this locality.

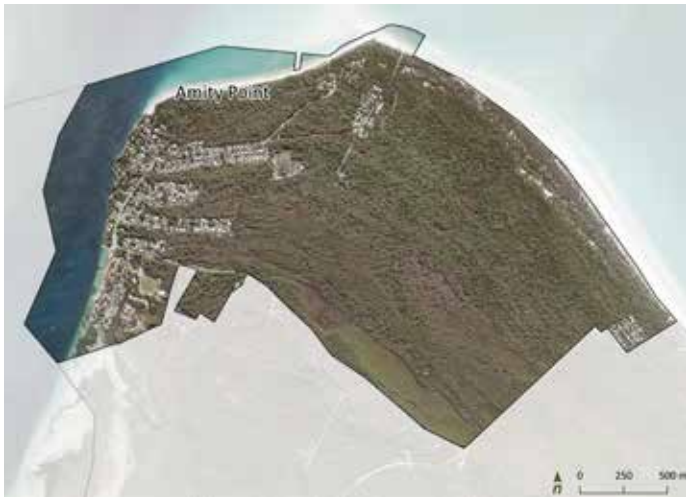


Figure 21. Amity Point

	Present-day	By 2040	By 2070	By 2100
AMITY POINT	Mitigate			
Enhance adaptive capacity	As per city-wide actions as applicable			
Planning	As per city-wide actions as applicable			
Modifying infrastructure	As per city-wide actions as applicable, including: Promote resilient homes program – linked to action 3.1.3			
Coastal engineering and management	Implement Shoreline Erosion Management Plan (SEMP) Confirm concept designs and approvals to upgrade the existing flow-slide barrier at Old Schoolhouse Park and Cabarita Park	Review and update Shoreline Erosion Management Plan Implement flow-slide barrier upgrades	Review pathway options Prepare concept design and approvals for upgrades and/or additional hazard mitigation works (if applicable), and implement (if triggered)	
Other considerations	Establish indicators (with implementation of SEMP) to monitor level of acceptable service and trigger change of pathway Examples include: • Rate of shoreline recession or damage to existing protection structures exceeds defined point → Planning for additional structural works or alternatives may commence			

Table 22. Amity Point adaptation pathway

Point Lookout

Point Lookout, the eastern-most suburb of North Stradbroke Island (Minjerribah) and Redland City, is located on an elevated rocky outcrop facing the Pacific Ocean (Figure 22).

The shoreline includes iconic sandy beaches that are naturally nourished by the sediment transport belt, which moves sand northwards along the east coast of Australia.

Long-term coastal hazard exposure is likely to be relatively low. However, the beach may be prone to episodic erosion events with storm activity.

The present-day adaptation response for Point Lookout is to continue to monitor coastal hazard risk into the future (Table 23).



Figure 22. Point Lookout

	Present-day	By 2040	By 2070	By 2100
POINT LOOKOUT	Monitor, maintain, prepare			
Enhance adaptive capacity	As per city-wide actions, include specific actions of: • Establish at Point Lookout as a focus site for action 1.2.5 - enhance signage on coastal hazards and the role of dunes and vegetation • Establish Point Lookout surf club as a key site for action 1.3.1 - a photo monitoring station (CoastSnap to similar) to monitor foreshore, beach and dune changes over time			
Planning	As per city-wide actions			
Modifying infrastructure	As per city-wide actions			
Coastal engineering and management	**Primary action:** Dune vegetation enhancement and monitoring, including Main Beach, Cylinder Beach and Flinders Beach			

Table 23. Point Lookout adaptation pathway

7 Implementation

Redland City Council will implement the Coastal Hazard Adaptation Strategy through a range of mechanisms including:

- An adaptive management framework
- Embedding outcomes and actions from the Strategy into existing Council process and activities
- Implementing new initiatives from the Strategy.

To guide implementation, a plan has been developed that includes additional detail on:

- Timeframes for actions
- Costing for priority 5–10 year actions
- Instruments, plans and processes (existing, modified, new) required to deliver adaptation options
- Potential funding sources
- Monitoring and evaluation
- Barriers to implementation and change management actions
- Partnership opportunities with stakeholders.

The Coastal Hazard Adaptation Strategy will be reviewed every 10 years, commencing at least two years prior to the Planning Scheme Review, which is also undertaken on a 10-year timeframe. The next review of the Plan will be in 2030. The review will include consideration of:

✓ Success of implementation to date:

- Integration into Council and stakeholder plans and processes
- Delivery of on-ground activities
- Community perspectives
- Reduction in coastal hazard risk.

✓ Triggers to update the Strategy including consideration of:

- Any changes in the policy environment (e.g. sea level risk predictions, approach to defining coastal hazard areas)
- Updated technical information that may be available
- Any new development and landscape changes in the region.



Cylinder Beach, North Stradbroke Island (Minjerribah)

References

LGAQ & DEHP (2016) QCoast2100 Developing a Coastal Hazard Adaptation Strategy: Minimum Standards and Guideline for Queensland Local Governments. Local Governments Association Queensland and Department of Environment Heritage and Protection, QLD.

RCC (2019a). Redland City Council Coastal Hazard Adaptation Strategy Communication and Engagement Plan. Report by Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) for Redland City Council.

RCC (2019b). Redland City Council Coastal Hazard Adaptation Strategy Phase 2: Scoping Study. Report by QYAC for Redland City Council.

RCC (2019c). Redland City Council Coastal Hazard Adaptation Strategy Phase 3: Identify areas exposed to current and future coastal hazards. Report by QYAC and Healthy Land and Water for Redland City Council.

RCC (2019d). Redland City Council Coastal Hazard Adaptation Strategy Phase 4: Identify key assets potentially impacted by future coastal hazards. Report by QYAC and Healthy Land and Water for Redland City Council.

RCC (2019e). Redland City Council Coastal Hazard Adaptation Strategy Phase 5: Risk Assessment Redlands-Quandamooka Coast. Report by QYAC and Healthy Land and Water for Redland City Council.

RCC (2020a). Redland City Council Coastal Hazard Adaptation Strategy Phase 6: Summary Report. Report by Alluvium for Redland City Council.

RCC (2020b). Redland City Council Coastal Hazard Adaptation Strategy Phase 7: Summary Report. Report by Alluvium, Jeremy Benn Pacific (JBP) and Natural Capital Economics (NCE) for Redland City Council.



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