

# TECHNICAL APPENDIX

## Blueprint for a sustainable Moreton Bay for people and nature (2025-2035)

Developed for The Moreton Bay Foundation

FINAL 8 August 2024

This document provides technical supporting information for Investment and Implementation Plan for Moreton Bay (2025-2035).

This report has been prepared by EcoFutures Consulting Australia Pty Ltd for The Moreton Bay Foundation under the contract titled 'Plan for Moreton Bay 2025-2035'.

**Authors:** Paul Maxwell, Emily Saeck, Vicki Martin, Jim Binney, Steve Charleton-Henderson, Tracy Schultz, Erin Thompson, Marika Seden

**Review:** Paul Maxwell, Emily Saeck

**Approved:** Paul Maxwell

**Version:** 2 –Final

**Date issued:** 8 Aug 2024

**Issued to:** The Moreton Bay Foundation

**Citation:** EcoFutures 2024. Technical appendix. Blueprint for a sustainable Moreton Bay for people and nature (2025-2035). Prepared for The Moreton Bay Foundation. Brisbane, Qld.

**Cover image:** Moreton Bay (P. Maxwell)

## APPENDICES CONTENTS

<b>A. Condition, Trend and Gap Analysis .....</b>	<b>1</b>
A.1. Purpose of Appendix A .....	2
A.2. Approach .....	2
A.3. Condition, Trend and Gap Analysis .....	7
A.4. Summary .....	42
<b>B. Social Barriers Analysis .....</b>	<b>51</b>
B.1. Purpose of Appendix B .....	52
B.2. Understanding marine stewardship for the Bay .....	52
B.3. Common social barriers to environmental actions .....	53
B.4. Social barriers to actions in the Blueprint – next steps .....	56
<b>C. Regulatory Barriers Analysis .....</b>	<b>58</b>
C.1. Purpose of Appendix C .....	59
C.2. Legislation relevant to Moreton Bay .....	59
C.3. Identifying legislative pathways to projects .....	72
<b>D. Options Assessment &amp; Prioritisation .....</b>	<b>84</b>
D.1. Purpose of Appendix D .....	85
D.2. Rationale for the Multi-Criteria Analysis (MCA) approach .....	85
D.3. Plan values and action themes - TMBF endorsed .....	86
D.4. MCA structure .....	86
D.5. Criteria and scoring approach .....	88
D.6. TMBF RAC/MAC feedback on the MCA framework .....	89
D.7. Results of the MCA scoring .....	90
D.8. Sensitivity analysis .....	91

The background features a series of overlapping, organic shapes in various shades of green and teal. A light green shape is at the top, followed by a white shape, then a light teal shape, and finally a dark teal shape at the bottom. The shapes overlap to create a layered, modern aesthetic.

# Appendix **A**

Condition, Trend and Gap Analysis

## A.1. Purpose of Appendix A

This document is an appendix to the *Blueprint for a sustainable Moreton Bay for people and nature (2025-2035)*, prepared by EcoFutures on behalf of The Moreton Bay Foundation. The purpose is to provide additional details of tasks undertaken to inform development of the Blueprint.

Specifically, this *condition, trends and gap analysis* task was a review and summary of available literature, to provide an assessment of the current state of Moreton Bay's values, trends and gaps in management. This included collating information about Moreton Bay's values through regional bodies, state and local government reports, unpublished ecological records, and key scientific articles. This task sought to answer the following questions:

- What are the key values of the Bay?
- Are there key targets, guidelines or benchmarks established for the values of the Bay?
- Is there data that can be used to sufficiently represent the current status of the values?
- Are there current pressures or threats on the values?
- Will there be future pressures or threats on the values (e.g., sea level rise)?

## A.2. Approach

*Note – this approach section is replicated from the Blueprint report.*

### A.2.1. Determining values

Many existing plans and activities occur in the region that seek to manage the values of the Bay. Numerous local and state government plans and strategies, include programs and actions are relevant to protecting and managing the values of the Bay. There are also other regional organisations such QYAC, Healthy Land and Water, the SEQ Council of Mayors and the Moreton Bay Foundation, who have developed plans and strategies that identify priorities for the Bay, the catchment and community. Most of these plans and strategies were developed following extensive stakeholder and community consultation to identify important values.



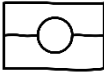



We reviewed sixteen key plans and strategies to collate a list of the Bay's values (Table A1). This integrated list of values represents the priorities of a broad range of the Bay's stakeholders and the community of SEQ. Stakeholder engagement activities were also undertaken to validate, refine and finalise the list of values presented. A gap analysis of every species, habitat and ecosystem service was beyond the scope of this assessment so identified values were collated into themes (Table A2). The themes selected were based on a synthesis of the value themes that were identified in key regional strategies and plans which included:

- *The SEQ Natural Resource Management Plan (2009-2031)*
- *Quandamooka Yoolooburrabee Aboriginal Corporation Strategic Plan 2022-2026*
- *SEQ Council of Mayors Resilient Rivers Initiative (2024)*
- *The Ramsar Information Sheet (2023)*
- *The Moreton Bay Marine Park Zoning Plan (2019) and User Guide (2023)*

**Table A1. The key plans and strategies reviewed to collate a list of the Bay’s values**

<b>Responsible organisation</b>	<b>Plan or strategy</b>
<b>Brisbane City Council</b>	Brisbane Vision 2031 Coastal Hazard Adaptation Strategy
<b>City of Moreton Bay</b>	Living Coast Plan 2023 Environment and Sustainability Plan 2042 Total Water Cycle Management Plan Coastal Hazard Adaptation Strategy
<b>Gold Coast City Council</b>	Our City Vision, Council Plan 2022-2027 Coastal Adaptation Plan
<b>Healthy Land and Water</b>	SEQ Natural Resource Management Plan
<b>International</b>	Secretariat of the Ramsar Convention: Ramsar Sites Information Service - Moreton Bay United Nations: Sustainable Development Goals
<b>Quandamooka Yoolooburrabee Aboriginal Corporation</b>	QYAC Strategic Plan 2022-2026 Research priorities – version 2 (2019)
<b>Queensland Government</b>	Draft Shaping SEQ – SEQ Regional Plan 2023 Update. Resilient Rivers Initiative: SEQ Waterways and Wetlands Investment Strategy
<b>Redlands City Council</b>	Bays and Creeks Plan 2021-31 Coastal Hazard Adaptation and Biohazard Strategy
<b>The Moreton Bay Foundation</b>	TMBF Strategic Plan

Table A2. Value themes in Moreton Bay identified through a review of existing plans and strategies

	Value themes	Description	Values assessed
	<i>Resilient natural &amp; unique ecosystem</i>	The Bay is valued as a natural, unique and biodiverse ecosystem. The Bay includes one of the most extensive intertidal areas of seagrass, mangrove and saltmarsh communities on the eastern coast of Australia, and is valuable for supporting fisheries resources, waterbirds (Ramsar) and marine megafauna of conservation significance.	Marine turtles, shorebirds, marine mammals, IUCN listed species, fish communities, open coastlines, mangroves, saltmarsh, seagrass, mudflats, coral reefs, shellfish reefs <sup>1</sup>
	<i>Coastal living</i>	A healthy Moreton Bay offers significant benefits to communities living along its coastline. There is the physical appeal and natural beauty of the Bay that is highly valued by many. There is also the benefit of protection of housing and infrastructure from storm tides, erosion and tidal inundation.	Natural beauty (amenity), Coastal community protection
	<i>Traditional Owner cultural values</i>	Natural and cultural resources of Quandamooka Country are fundamental to continuing Quandamooka’s living culture and supporting a vibrant, thriving economy and healthy community. First Nations people in SEQ have an intrinsic connection to the land and water, grounded deeply in their cultural, spiritual and historical identity. Dispossession and rapid urban development have broken their engagement with sea country, restricting their cultural practices and decision-making power. This has led to changed ecosystems, loss of traditional knowledge and impacts on sites of cultural importance. This study is an opportunity to collaborate with First Nations people to increase their participation in and the incorporation of their traditional knowledge and practices into sea country management in SEQ. A priority for community is to care for the natural environment on Country and to gather, sustain, share and grow the Quandamooka cultural knowledge and identity.	Not analysed
	<i>Community connection &amp; stewardship</i>	Communities value the Bay through a connection with this natural space, feeling an emotional bond. It is valued for the contribution to wellbeing and sense of identity for individuals and the local community. For Traditional Owners the Bay holds spiritual and cultural significance, representing ancestral connections and traditional practices. The Bay is also valued as a place of exploration, discovery, and learning. Communities who are connected with natural spaces have a heightened sense of its value and increased stewardship towards its protection. Here we define stewardship as: the willingness and capacity for “individuals, organisations and industry to actively manage and value the Bay; to remove, avoid or minimise negative impacts and proactively restore or conserve ecological health of associated waterways, wetlands and aquatic and marine environments”.	Community connection, community stewardship, wellbeing and identity, exploration, discovery for young people
	<i>Sustainable use of ecosystems</i>	Sustainably managing and ‘using’ the Bay’s resources is critical for the protection of the social, economic, and cultural values that it provides. This is especially important as the population of SEQ quickly rises and old use and management patterns and practices cannot be sustained. Traditional-owners have long standing spiritual and cultural obligations and tradition law and customs in respect to lands and waters, and the protection and sustainable use of the natural resources is highly valued.	Fisheries, eco-tourism, wastewater treatment cycle
	<i>Access &amp; recreation</i>	Access to the Bay is a strong lifestyle value for the local community, including recreational fishing, boating, swimming, walking, enjoying nature and spending time with friends and family. Access and some forms of recreation can lead to unsustainable use; however access and recreation is also positive for creating community connection and stewardship towards environmental protection.	Recreation (boating, fishing, diving/snorkelling), swimming, nature-based experiences

<sup>1</sup> Moreton Bay hosts other species and communities not listed here. Listed are species and communities specifically referred to in existing plans and strategies and identified as priority values by stakeholders as part of this study.

## A.2.2. Condition assessment of key values

Current condition, and trends in condition, were assessed for each of the key values in each value theme. We determined the condition and trend for each value based on a review of primary and grey literature as well as expert opinion (established through the stakeholder consultation).

The condition and trend for each value was assigned a qualitative category that enabled a comparison between values and to aid in identifying gaps in management (Table A3). The condition category for each value was determined using availability of data (e.g. where data or research were available to determine the condition) and defines the condition of the value as approaching, below, or well below reference or benchmark condition. Where possible, only data that considers the whole of Moreton Bay was used for the condition assessment, however some values are assessed based on information from representative locations/populations across the Bay.

The trend category for each value was determined by deviation from a baseline, i.e. is either above, at, or below, a defined baseline. Baselines (e.g. pre-clearing, 1980, 2011) vary between values, as consistent baselines are not available for all values. Further details on our approach is provided in Appendix A.

**Table A3. The qualitative categories used to describe the condition and trend of each value**

Status of condition / trend in condition category	Description of category
<b>Unknown or no data</b>	Where no data is available and/or no baseline information is available to determine current condition or trend in condition.
<b>Poor/declining</b>	Condition of the value is much lower than its reference condition or benchmark. The value delivers limited ecosystem services. For example, modified and disturbed ecosystem that does not resemble pre-disturbance structure and function. Condition is declining from a defined baseline or from any previous assessments.
<b>Fair/stable</b>	The condition of the value is between degraded and reference condition or benchmark. The values deliver some ecosystem services but are likely to be variable over time. For example, modified and disturbed ecosystems that have limited elements that resemble pre-disturbance structure and function. Condition is not changing (neither improving or declining) from defined baseline or from previous assessments.
<b>Good/improving</b>	The value is in a similar condition to reference or benchmarks. The values deliver the majority of ecosystems services expected. For example, ecosystem may be disturbed and slightly modified but still resembles remnant ecosystems in structure and has many of the same ecological functions. Condition is improving from a defined baseline or from previous assessments.

### A.2.3. Determining threats to key values

Current and future threats for assessment in the gap analysis were identified through the review of existing plans and strategies. Threats were then collated into themes (Table A4).

**Table A4. Key threats to values identified through the review of existing plans and strategies**

Threat theme	Description	Threats assessed
<b><i>Pollutants</i></b>	Catchment-derived pollutants are one of the most significant threats to the values of the Bay. Sediment smothers coastal habitats like seagrasses, shellfish and coral reefs and sandy intertidal zones and creating poor water quality that impacts the types of plants and animals that can inhabit the Bay, as well as impacting the amenity and tourism values of the Bay. Nutrients and toxicants change the productivity of the Bay's ecosystem and have been linked to algal blooms and fish kills. Pollutants come from both point sources (e.g. wastewater discharge locations) and diffuse sources (e.g. catchment erosion, urban stormwater runoff)	Catchment runoff – sediments, nutrients, toxicants, current water quality (representing an ongoing chronic threat to Bay values), litter and microplastics
<b><i>Ecosystem modification</i></b>	Ecosystem modification are changes to the structure and function of the ecosystem beyond what would be considered natural in its reference or benchmark state. Changes to habitat extent, the introduction of pests and weeds and intensifying coastal erosion are modifying how the Bay's ecosystem functions, reducing its ability to recover from extreme events like flooding.	Coastal erosion, incursions of weeds/pests/disease, reduction of habitat area width/extent, fragmentation/habitat connectivity
<b><i>Climate</i></b>	Climate change represents the largest future threat to the Bay's values. Increasing sea levels and sea temperatures are likely to increase coastal erosion and damaged or destroy the habitats in the Bay as well as the biodiversity that inhabit them. Increasing extreme events like more intense and regular flooding will further exacerbate the current impacts associated with catchment run off.	Sea level rise, increasing temperature, increase in extreme events and flooding,
<b><i>Population growth</i></b>	SEQ is one of the fastest growing regions in Australia. By 2046, the population of the region is expected to increase by 2.2 million people to approximately 6 million. Increasing population leads to development and urbanisation along the coast which in turn leads to increases in artificial coastlines, increasing recreation and commercial activity in the Bay which increases disturbances of flora and fauna, and an increase in the use of the Bay's natural resources.	Coastal development/ artificial coastlines, human & domestic animal disturbances / overuse, harvesting/ overfishing/ extraction
<b><i>Stewardship</i></b>	Social survey and research has shown that perceived community apathy or lack of knowledge of the Bay's unique values is a major barrier to legislative change or increased funding for restoration or protection activities in the Bay. For individuals, instilling a willingness to change behaviour, advocate for change, or act in ways to protect an ecological asset like Moreton Bay requires a high degree of connection and pride in the value of the asset.	Low levels of community connection, low levels of community awareness, low levels of community stewardship
<b><i>Research and Development</i></b>	A lack of data or knowledge was identified as a significant threat to the management of many of the Bay's values. In many cases, the condition or trend of the value is unknown, has minimal data, or the data is not widely known or available to the Bay's stakeholders and management organisations.	Lack of data and knowledge pertaining to the Bay's values

### A.2.4. Engagement and consultation

Stakeholder engagement was carried out to validate results and further refine our understanding of the values and threats to the Bay. The following three methods were used to engage stakeholders:

- One-on-one online interviews with key stakeholders
- One half-day stakeholder workshop (13<sup>th</sup> February)
- Stakeholder survey (launched 2<sup>nd</sup> February)

The purpose of the engagement was to seek stakeholder input on the future direction of The Moreton Bay Foundation’s activities, and also help build a common understanding of the challenges and strategic direction for the protection and management of the Bay.

Specifically, the engagement aimed to establish key stakeholder views on:

- The values of and threats to the health of the Bay being managed by their organisation
- Gaps in management of the Bay
- Barriers to action to improve the health of the Bay
- Opportunities for action
- The role for The Moreton Bay Foundation

A summary of all the organisations who were consulted through this process are summarised in Table A5. Overall, 24 stakeholder organisations and 37 individuals were consulted to inform the assessment of the values and threats to the Bay.

**Table A5. Stakeholder organisation represented in the consultation activities**

One-on-one interviews (13 individuals)	Stakeholder workshop (16 individuals)	Online survey (13 individuals)
Brisbane City Council	The Moreton Bay Foundation	Fisheries Queensland
Gold Coast Council	Fisheries Queensland, Department of Agriculture and Fisheries	Fisheries Queensland, Department of Agriculture and Fisheries
Moreton Bay Regional Council	Gold Coast Waterways Authority	Healthy Land and Water
OzFish	Healthy Land and Water	Logan City Council
Queensland Department of Environment, Science and Innovation	Logan City Council	Port of Brisbane Pty Ltd
Queensland Parks and Wildlife Service	Moreton Bay Education Centre	Queensland Department of Environment, Science and Innovation
Redland City Council	OzFish	Queensland Department of Transport and Main Roads
Resilient Rivers Initiative (Council of Mayors SEQ)	Port of Brisbane	Queensland Wader Study Group
	Qld Urban Utilities	Tourism and Events Queensland
	Reef Check	Unitywater
	Resilient Rivers Initiative (Council of Mayors SEQ)	Urban Utilities
	Tangalooma EcoMarines	
	Queensland Wader Study Group	

## A.3. Condition, Trend and Gap Analysis

This section summarises of the findings of the condition and threat assessment for each value assessed in this study.

### A.3.1. Resilient natural & unique ecosystem

#### A.3.1.1. Marine Turtles

Value	Marine Turtles
<i>Description</i>	Six species of marine turtles have been recorded in Moreton Bay, these are: the loggerhead turtle ( <i>Caretta caretta</i> ); green turtle ( <i>Chelonia mydas</i> ); hawksbill turtle ( <i>Eretmochelys imbricata</i> ); olive ridley turtle ( <i>Lepidochelys olivacea</i> ); flatback turtle ( <i>Natator depressus</i> ); and leatherback turtle ( <i>Dermochelys coriacea</i> ). Two species (green and loggerhead) migrate into the Moreton Bay waters and nest annually at low density

Value	Marine Turtles
	<p>on the ocean beaches of the Bay islands.<sup>2</sup> All species are IUCN internationally recognised as threatened under the IUCN Redlist<sup>3</sup> and their populations are in decline, except for the flatback turtle which is considered data deficient.<sup>4</sup> Marine turtles are highly valued by Traditional Owners, notably as a hunting resource for long-kept hunting traditions.</p> <p>Historically sea turtles were hunted by colonising settlers (1824-1950). Modern day threats include entanglements (in nets, lines, traps, etc.), boat strikes, and ingestion of synthetic materials like plastics. Light pollution and 4WDs on the Bay's island beaches is a threat to turtle nesting. With climate warming, many sea turtle populations are also vulnerable to sex ratio skew<sup>5</sup> as higher ambient temperatures produce greater percentages of female hatchlings. While the feminisation of populations is not an immediate concern for Moreton Bay populations, it may be in the future as temperatures continue to reach record highs.</p>
<i>State category (poor, fair, good, no data)</i>	Unknown
<i>Trend category (declining, stable, improving, no data)</i>	Unknown
<i>Threats - Current Moreton Bay</i>	Litter / microplastics Coastal erosion Weeds / pests / disease / algal blooms Habitat area width / extent decline Rainfall / extreme events / flooding Coastal development / artificial coastlines Human & dom. animal disturb / overuse Lack of data/knowledge
<i>Threats - Future Moreton Bay</i>	Sea level rise Temperature increases Rainfall/extreme events / flooding Coastal development / artificial coastlines Human & dom. animal disturb / overuse
<i>Organisations acting on value or threats</i>	QPWS through the management of Marine Park Department of Environment and Science Research organisations (e.g. UQ) doing research Traditional owners through management of nesting habitat Local government through management of nesting habitat (light pollution, vehicle access to nesting beaches)
<i>Impact of actions</i>	Predominantly a regional focus on research and monitoring Low impact in terms of regionally co-ordinated management of impacts

<sup>2</sup> Limpus CJ, Coffee OI. (2019). Marine turtles in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

<sup>3</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>4</sup> IUCN (2024). The IUCN Red List of Threatened Species, Version 2024-1 [WWW Document]. <https://www.iucnredlist.org>. URL <https://www.iucnredlist.org> (accessed 7.26.24).

<sup>5</sup> Blechschmidt, J., Wittmann, M. J., & Blüml, C. (2020). Climate change and green sea turtle sex ratio—preventing possible extinction. *Genes*, 11(5), 588.

Value	Marine Turtles
<i>Opportunities</i>	<p>Marine turtles in the Bay have been well studied due to the efforts of government and non-government researchers, however ongoing assessment is needed to better understand the impacts of human influence on their population and health<sup>6</sup>.</p> <p>Research to quantify the impact of recreation</p> <p>Develop and implement a regionally coordinated monitoring and evaluation program to support management</p>

### A.3.1.2. Shorebirds

Value	Shorebirds, Ramsar
<i>Description</i>	<p>The Bay supports more than 50,000 waterbirds (43 species), including visited by 35,000 migratory shorebirds (28 species) in non-breeding season and hosting thousands of young shorebird year-round before maturing to migrate.<sup>7,8,9</sup> It is recognised nationally and internationally as one of the most significant migratory shorebird sites in Australia. In 1993 Moreton Bay was listed as a site under the Convention on Wetlands of International Significance (The Ramsar Convention) (i.e. a network site under the East Asian-Australasian Flyway Partnership (site code EAAF013)). It supports over 1% of the estimated flyway population of at least nine migratory shorebird species, including listed threatened species.</p> <p>All migratory shorebirds feed on tidal sand and mudflats exposed at low tide, which occur throughout the Bay (approx. 100km<sup>2</sup>). Shorebirds feed on benthic macroinvertebrates infauna including worms, crustaceans and bivalve molluscs. The density of prey relates to shorebird abundance and diversity.</p> <p>At high-tide shorebirds congregate and roost above the waterline, requiring open flat areas with no disturbance. There are many important roost sites across the Bay, that support internationally or nationally important numbers of shorebirds. In 2023, the existing and potential shorebird habitat was mapped by Healthy Land and Water (first update since 2005) synthesising all currently available data, including remote sensing and survey counts. Key roosting and foraging areas are Port of Brisbane, Kakadu Beach, Toorbul, Manly Harbour and tidal flats along western shore of Minjerribah (North Stradbroke Island). The Port of Brisbane reclamation areas has become an increasingly important roost site over the past five years and now it is estimated that 30-50% of migratory birds depend on this habitat.<sup>8,10</sup></p> <p>There are a range of international pressures that threaten the Bay's shorebird populations, like destruction of habitat in the East Asian-Australasian Flyway. There is also increasing local pressure on roost and feeding sites which includes mangrove encroachment, urban encroachment, human disturbance, coastal erosion and sea-level rise. <sup>8</sup> Far Eastern Curlew (critically endangered), Curlew Sandpiper (critically endangered) and Lesser Sand Plover (<i>Charadrius mongolus</i>) (endangered) were reported to have undergone significant declines in abundance across Moreton Bay over the period 1992 to 2008<sup>11</sup> and the period 1992 to 2012.<sup>12</sup> Fuller et al (2021) assessed 218 roosting sites across the Bay and found that 95% of sites were impacted by one or more threats and that 15 have become unsuitable for shorebirds<sup>8</sup>. Some foraging sites have found no change in migratory shorebird abundance over recent years, suggesting the importance of existing foraging sites is going up as others become less available.<sup>8,10</sup></p> <p>Coastal urban development threatens the Bay's shorebird habitats, directly by clearing of vegetation (mangrove, saltmarsh) and indirectly by increasing human-wildlife interactions (e.g. recreationists and dog walkers disturbing roosting and feeding migratory shorebirds). Lack of community awareness also</p>

<sup>6</sup> Department of Climate Change, Energy, the Environment and Water, Australia (2017). Recovery Plan for Marine Turtles in Australia 2017. Department of the Environment and Energy, the NSW Government and the Queensland Government, accessed 15 Jun 2024. Available at: <https://www.dcceew.gov.au/environment/marine/publications/recovery-plan-marine-turtles-australia-2017>

<sup>7</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>8</sup> Fuller R., Clemens R., Woodworth B., Moffitt D., Steven R., Simmons B. A. (2021) Managing Threats to Migratory Shorebirds in Moreton Bay. Final report to Healthy Land and Water. Brisbane.

<sup>9</sup> Fuller R, Milton DA, Rothlisberg P, Clemens RS, Coleman J, Murray K, Dhanjal-Adams KL, Edwards D, Finn PG, Skilleter G, Stigner M, Woodworth BK. (2019). Migratory shorebirds of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

<sup>10</sup> Lloyd, P., Finn, P.G., Pople, L. (2021) Twelve years of monitoring shorebird use of a tidal flat at Brisbane Airport in Moreton Bay, Queensland, Stilt.

<sup>11</sup> Wilson, H. B., Kendall, B. E., Fuller, R. A., Milton, D. A., & Possingham, H. P. (2011). Analyzing variability and the rate of decline of migratory shorebirds in Moreton Bay, Australia. Conservation Biology, 25(4), 758-766.

<sup>12</sup> Dhanjal-Adams, K. L., Fuller, R. A., Murray, N. J., Studts, C. E., Wilson, H. B., Milton, D. A., & Kendall, B. E. (2019). Distinguishing local and global correlates of population change in migratory species. Diversity and Distributions, 25(5), 797-808.

Value	Shorebirds, Ramsar
	<p>threatens Shorebirds, as there appears to be a low level of knowledge about migratory shorebirds in the Bay. A study conducted in 2022<sup>13</sup> found that South East Queenslanders' awareness of 'endangered birds that migrate from the northern hemisphere' is low, with only 25% of respondents indicating they know about Moreton Bay's migratory birds.</p> <p>The Queensland Wader Study group,<sup>14</sup> a volunteer-based organisation, was established in 1992 to monitor and conserve shorebird populations. Shorebird counts are monthly which is unique to shorebird monitoring efforts nationally.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Fair to Good.</b> Bay contains 28 species of shorebirds.
<i>Trend category (declining, stable, improving, no data)</i>	<b>Declining.</b> Population declining predominantly due to external pressures
<i>Threats -Current Moreton Bay</i>	<p>Off-leash dogs disturbance of foraging habitat at low tide</p> <p>Lack of future-planning and protection for artificial shorebird roost sites at Manley Harbour and Port of Brisbane reclamation ponds (currently very significant sites in the network)</p> <p>Absence of roosts adjacent to large tidal flats along western shore of Minjerribah (North Stradbroke Island)</p> <p>Development and disturbance threats to the large roosts at Toorbul and Kakadu Beach</p> <p>Vegetation overgrowth (primarily mangroves) threatens two thirds of roosting sites</p> <p>Habitat loss along migration corridors (i.e. outside Moreton Bay)</p> <p>Mangrove encroachment</p> <p>Litter / microplastics</p> <p>Lack of knowledge about shorebirds</p>
<i>Threats - Future Moreton Bay</i>	<p>Sea level rise and loss of roosting habitat</p> <p>Increased coastal erosion from extreme events</p> <p>Damaging flooding from extreme events</p> <p>Coastal development</p> <p>Human and domestic animal disturbance / overuse</p>
<i>Organisations acting on value or threats</i>	<p>QPWS through the management of some roosting and foraging sites in the Bay</p> <p>DES through the Ramsar agreement</p> <p>QLD Wader Study Group</p> <p>Port of Brisbane – monitoring with QWSG</p> <p>Research organisation (e.g. UQ) doing research</p>
<i>Impact of actions</i>	<p>Predominantly a regional focus on research and monitoring</p> <p>Low impact in terms of regionally co-ordinated management of roost and foraging sites</p>
<i>Opportunities</i>	<p>Work with the existing actors to advocate for regional protection/management of roost and feeding habitat</p> <p>Targeted research to understand impacts of recreation on Bay fauna in general, including shorebirds</p> <p>Develop a monitoring and evaluation framework to support the management</p> <p>Support ongoing monitoring and conservation of shorebirds by citizen science groups, such as Queensland Wader Study group</p>

<sup>13</sup> Dean, A. and Shultz, T., (2023). *Community understanding and appreciation of Moreton Bay – a framework to support engaging communities*. Report to the Moreton Bay Foundation.

<sup>14</sup> Queensland Wader Study Group. Website <https://waders.org.au/>

### A.3.1.3. Marine Mammals

Value	Marine Mammals
<i>Description</i>	<p>The Bay supports one of the most diverse and abundant marine mammal fauna communities of the east coast of Australia.<sup>15,16</sup> The marine mammals of Moreton Bay are a charismatic species, valued by many Traditional Custodians for their cultural and spiritual significance, in addition to being an important resource for meat and oil. Resident populations of dugongs and dolphins are joined by migrant whale species that move along the east coast. Specifically, there are two species of bottlenose dolphin species commonly found in the Bay (common bottlenose dolphin (<i>Tursiops truncatus</i>) and inshore bottlenose dolphins (<i>Tursiops aduncus</i>)). Also present is the IUCN listed species Australian Humpback Dolphin (<i>Sousa sahulensis</i>). Frequent visitors to the Bay are Humpback whales (<i>Megaptera novaeangliae</i>) and Southern right whales (<i>Eubalaena australis</i>), with occasional visitors to the region being dwarf minke whales (<i>Balaenoptera acutorostrata</i>), killer whales (<i>Orca orcinus</i>), Eden’s whales (<i>Balaenoptera edeni</i>), sperm whales (<i>Physeter macrocephalus</i>), pygmy sperm whales (<i>Kogia breviceps</i>), blue whales (<i>B. musculus</i>) and Blainville’s beaked whales (<i>Mesoplodon densirostris</i>). Dugongs (<i>Dugong dugon</i>) are one of the most abundant marine mammals in Australia’s subtropical waters, with large resident populations in Moreton Bay often found in herds of 10 to 100 individuals. Dugongs graze on seagrasses in the clear, shallow waters of Moreton Bay; favouring the fast growing, pioneer seagrass species like <i>Halophila ovalis</i>. The Bay has a small numbers of long-nosed fur seals (<i>Arctocephalus forsteri</i>) that are sighted annually. There are also many other occasional marine mammal visitors to the Bay.</p> <p>Surveys of dugong populations have been conducted regularly over the past 20 years. Continued monitoring of their population and threats to their health and survival are needed to ensure their sustainability. The population of dolphin species that use the Bay is less well known. More consistent population monitoring and assessment of the behaviour and use of the Bays’ resources by dolphins is needed as is a better understanding of the impacts of habitat loss and variability in food sources. Specifically, regional support for research and management organisations to consistently monitor and assess the Australian Humpback Dolphin is needed. The Bay is the southernmost population of the species which is listed as vulnerable in Queensland so requires more focus in order to better direct management efforts to protect the species.</p>
<i>State category (poor, fair, good, no data)</i>	Unknown
<i>Trend category (declining, stable, improving, no data)</i>	Unknown
<i>Threats -Current Moreton Bay</i>	Litter / microplastics Weeds / pests / disease / algal blooms Habitat area width / extent decline Coastal development / artificial coastlines Human & dom. animal disturb / overuse Low community stewardship Lack of monitoring and understanding of trends
<i>Threats - Future Moreton Bay</i>	Habitat area width / extent decline Coastal development / artificial coastlines Human & dom. animal disturb / overuse

<sup>15</sup> Lanyon J, Noad M, Meager J. (2019). Ecology of the marine mammals of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>16</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis Ramsar.org/> <https://rsis Ramsar.org/ris/631> or [www.dceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dceew.gov.au/sites/default/files/documents/41-ris.pdf)

Value	Marine Mammals
<i>Organisations acting on value or threats</i>	QPWS through the management of Marine Park Research organisation (e.g. UQ) doing research International Union for Conservation of Nature (IUCN Red List of Threatened Species)
<i>Impact of actions</i>	Lack of knowledge and co-ordination of management at the scale required for long-term sustainability
<i>Gaps</i>	Continued monitoring and evaluation of populations and threats, to guide management
<i>Opportunities</i>	Regional support for research and management organisations to consistently monitor

#### A.3.1.4. IUCN listed species

Value	IUCN listed species
<i>Description</i>	The Bay supports a high diversity of threatened flora and fauna species, and ecological communities listed nationally under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), and/ or internationally under the IUCN Redlist. <sup>17, 18, 19</sup> Many of the biodiversity values identified in the strategies and plans are not actively monitored. As such, the condition and trend in the population of several of the IUCN listed species found in the Bay which are identified as in need of protection in legislation, strategies and plans - e.g. Dugong ( <i>Dugong dugong</i> ), all six marine turtles found in the Bay, water mouse ( <i>Xeromys myoides</i> ), Australian Humpback Dolphin ( <i>Sousa sahulensis</i> ), great white shark ( <i>Carcharodon carcharias</i> ), manta ray ( <i>Mobula alfredi</i> ) is largely unknown. Consistent and regionally co-ordinated monitoring and research is needed to better understand the viability of, and threats to the populations of these species. Without ongoing assessment of how these species use Moreton Bay currently, management efforts to retain these values with both current and future threats is made more difficult.
<i>State category (poor, fair, good, no data)</i>	Unknown
<i>Trend category (declining, stable, improving, no data)</i>	Unknown
<i>Threats -Current Moreton Bay</i>	Litter / microplastics Coastal erosion Habitat area width / extent decline Fragmentation/ habitat connectivity Rainfall/extreme events / flooding Coastal development / artificial coastlines Human & dom. animal disturb / overuse Low community awareness Low community stewardship Lack of monitoring and understanding of trends
<i>Threats - Future Moreton Bay</i>	Coastal erosion Habitat area width / extent decline

<sup>17</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>18</sup> IUCN, (2024). The IUCN Red List of Threatened Species, Version 2024-1 [WWW Document]. <https://www.iucnredlist.org> (accessed 7.26.24).

<sup>19</sup> Department of Climate Change, Energy, the Environment and Water, Australia (2022) The Threatened Species Action Plan (2022-2032). Available at: <https://www.dceew.gov.au/environment/biodiversity/threatened/action-plan>

Value	IUCN listed species
	Fragmentation/ habitat connectivity Sea level rise Temperature increases Rainfall/extreme events / flooding Coastal development / artificial coastlines Human & dom. animal disturb / overuse
<i>Organisations acting on value or threats</i>	Queensland Government Department of Environment and Science (RAMSAR) Queensland Parks and Wildlife Service (Moreton Bay Marine Park) Australian Government (e.g. 2022-2032 Threatened Species Action Plan: Towards Zero Extinctions) Research organisation (e.g. UQ) doing research International Union for Conservation of Nature (IUCN Red List of Threatened Species)
<i>Impact of actions</i>	Lack of knowledge and co-ordination of management at the scale required for long-term sustainability
<i>Gaps</i>	Continued monitoring and evaluation of populations and threats, to assess condition or trends in populations, and guide management
<i>Opportunities</i>	Regional support for research and management organisations to consistently monitor

### A.3.1.5. Fish communities

Value	Fish communities
<i>Description</i>	<p>Fish communities of Moreton Bay are diverse and include many species harvested by indigenous, recreational and commercial fishers, as well as numerous taxa that are of conservation concern. Fish communities support and influence food webs across ecosystems and perform key ecological functions (production, herbivory, predation, scavenging) that support many other Moreton Bay values reviewed in this report, including biodiversity, seagrass, mangroves, coral reefs and fisheries. As such they represent significant ecological, social, cultural and economic value.</p> <p>The fish assemblages of Moreton Bay have been heavily modified by the combined effects of water quality degradation, coastal urbanisation and fishing. The fish fauna of mangroves, seagrasses, inshore reefs and intertidal flats has been relatively well sampled in Moreton Bay. By contrast, fish surveys in saltmarshes, soft sediments, offshore reefs and surf zones are sparse and incomplete.<sup>20</sup></p> <p>Fish habitat is the seascape of seagrass, mangroves, saltmarsh, inshore reefs, intertidal flats, soft sediments, offshore reefs, surf zones and man-made structures. While many Moreton Bay studies to date have focused on fish communities associated with single seascape features,<sup>20</sup> a few more recent studies have looked intensively at the influence of the broader seascape.<sup>21,22</sup> These studies indicate that the condition of fish communities and fish habitats needs to be interpreted in the context of the broader seascape. Specifically, parameters such as extent, condition and proximity between habitat significantly influences abundances and diversity.</p> <p>Fish communities in the estuaries of the Moreton Bay catchment were extensively studied 2019-2023, in one of Australia's largest fish studies.<sup>21,23</sup> Moreton Bay and associated estuaries supports a high</p>

<sup>20</sup> Olds AD, Gilby BL, Connolly RM, Tibbetts IR, Henderson CJ, Stevens T, Thackwray SK, Schlacher TA. (2019). Fishes of Moreton Bay: Ecology, human impacts, and conservation. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>21</sup> Gilby, B., Henderson, C., (2023). Optimising estuarine restoration plans and long-term monitoring for fish and fisheries. Report to Healthy Land & Water.

<sup>22</sup> Goodridge Gaines, L.A., Olds, A.D., Henderson, C.J., Connolly, R.M., Schlacher, T.A., Jones, T.R., Gilby, B.L., (2020). Linking ecosystem condition and landscape context in the conservation of ecosystem multifunctionality. *Biol Conserv* 243. <https://doi.org/10.1016/j.biocon.2020.108479>

<sup>23</sup> Healthy Land and Water (2024). Report Card [WWW Document]. Available at: <https://reportcard.hlw.org.au/> (accessed 1.9.24).

Value	Fish communities
-------	------------------

abundance and diversity of fish.<sup>21,20</sup> The abundance and diversity of fish communities, has been found to increase with:

- Improving water quality (gradient from west to east);
- Reduced coastal urbanisation (gradient from west to east);**Error! Bookmark not defined.**
- Greater connectivity with mangroves (extent and proximity effects, up to a threshold level);<sup>21</sup>
- Greater proximity to the estuary mouth (which correlates with distance to seagrass and saltmarsh);<sup>21</sup>
- Lower fishing pressure - highest inside marine park reserves that prohibit fishing;<sup>22,24</sup> and,
- Mangrove forests nearer to open ocean and moderate-sized seagrass meadows, and far from coral reefs<sup>22</sup>.

In addition, it was found that the resilience of many fish species, and their capacity to resist and recovery from disturbances, is highest in:

- Marine reserves that prohibit fishing over seagrass meadows and coral reefs;<sup>22</sup> and,
- Estuaries with a greater extent of natural vegetation features (especially mangroves).<sup>21</sup>

There is very little understanding of the change over time of fish stocks in Moreton Bay and the effect that human impact and climate changes has on those changes. This represents a significant gap given the commercial and recreational interest in Moreton Bay fisheries and the recognition of the Bay as significant for fish biodiversity.

<i>State category</i> (poor, fair, good, no data)	<b>Fair to Good.</b> With the exception of saltmarsh, which is poor in terms of extent, condition and connectivity.
<i>Trend category</i> (declining, stable, improving, no data)	<b>Stable</b>
<i>Threats -Current Moreton Bay</i>	Urbanisation pressure on coastal wetlands Water quality Harvesting Habitat removal and degradation (across the Bay and estuaries) Loss of connection with river mouths and migratory pathways Litter / microplastics Weeds / pests / diseases / algal blooms Extreme events / flooding Coastal development
<i>Threats - Future Moreton Bay</i>	Increased sea temperatures Sea level rise, reducing available habitat Flood intensity and frequency Habitat area extent decline Harvesting / overfishing / overuse Lack of understanding of trends
<i>Organisations acting on value or threats</i>	Queensland Government Department of Agriculture and Fisheries (Fisheries and fish habitat management) Queensland Government Department of Environment and Science (RAMSAR) Queensland Parks and Wildlife Service (No take zones)
<i>Impact of actions</i>	Good impact

<sup>24</sup> Gilby B, Olds A, Rissik D, Henderson C, Connolly R, Stevens T, Schlacher T. (2019). Performance of marine reserves for fish and associated ecological functions in the Moreton Bay Marine Park. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

Value	Fish communities
<i>Gaps</i>	<p>Little understanding of the change over time of fish stocks in Moreton Bay and the effect that human impact and climate changes has on those changes</p> <p>No strategy for optimising estuarine habitat connectivity for fisheries benefit</p> <p>No plan for protecting saltmarsh</p>
<i>Opportunities</i>	<p>Targeted research to understand impacts of recreational fishing</p> <p>Develop a regional prioritisation for coastal habitat locations that require enhancement and protection</p> <p>Advocacy for protection/restoration/management of mangroves and saltmarshes</p> <p>Awareness campaign for protection/management of mangroves and saltmarshes</p> <p>Program of buybacks of coastal land for mangrove and saltmarsh protection and restoration</p> <p>Education campaign for sustainable recreational use</p> <p>Climate risk and vulnerability assessment</p>

### A.3.1.6. Open coastline (headlands, beaches, and dunes)

Value	Open coastline (headlands, beaches, and dunes)
<i>Description</i>	<p>Coastlines in the Moreton Bay area are a heterogenous environment, influenced by the historical and current physical processes of the region. Sand beaches on the eastern side of Moreton Bay are formed by the south-north sand transport system that begins in New South Wales.<sup>25</sup> These sand beaches and dunes are stabilised by vegetation such as <i>Poaceae</i>, <i>Cyperaceae</i>, and <i>Fabaceae</i>; a number of which also are endemic and threatened.<sup>26</sup> The beaches also provide habitats for a variety invertebrate species and nesting loggerhead turtles.</p> <p>Moreton Bay coastlines are also popular residential and tourist locations, causing rapid development in areas for various residential and commercial purposes. This is exacerbated by increased connectivity within the Bay, following upgrades to ferry terminal infrastructures and car park areas.</p> <p>Beaches are under increasing pressure because of urban development as indicated by the significant increase in the number of freehold properties directly adjoining coastal environments.</p> <p>The Queensland Government has defined “Erosion Prone Areas” and identified them using mapping and modelling. In a Coastal Hazard Adaptation Strategy, Redland City Council has determined areas with open coast and those affected by high tidal zones are considered most vulnerable to erosion.<sup>27</sup> Other coastal hazards include storm tide inundation due to sea level rise as well as the increased frequency of and intensity of storms and cyclones.</p> <p>Increasing urbanisation and traffic in the area is also impacting the area. Sand beaches and dunes are eroded as more residents, tourists, and vehicles travel throughout the region. Mitigation strategies by local government has included the revegetation and protection of native flora.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Unknown.</b>
<i>Trend category (declining, stable, improving, no data)</i>	<b>Declining.</b> Based on evidence of increasing threats.
<i>Threats -Current Moreton Bay</i>	<p>Habitat removal and degradation</p> <p>Coastal development</p> <p>Coastal erosion</p> <p>Pests and weeds</p> <p>Artificial coastlines/seawalls</p>

<sup>25</sup> McPhee, D. (2017). Environmental History and Ecology of Moreton Bay. CSIRO Publishing.

<sup>26</sup> Stephens, K. (2011). Comparative floristic analysis of vegetation on the Dune Islands of South-East Queensland. The Proceedings of the Royal Society of Queensland 117, 141–180.

<sup>27</sup> Redland City Council (2021). Coastal Hazard Adaptation Strategy. Report by Alluvium for Redland City Council

Value	Open coastline (headlands, beaches, and dunes)
	<p>Human disturbance (e.g. 4WD)</p> <p>Lack of clear legislative levers (SPP stormwater provisions, EPA WQO, Marine Parks Act restoration, Native Vegetation Act land clearing)</p> <p>Low political pressure from community</p> <p>Lack of monitoring and understanding of trends</p>
<i>Threats - Future Moreton Bay</i>	Sea level rise
<i>Organisations acting on value or threats</i>	<p>Healthy Land and Water</p> <p>Queensland Parks and Wildlife Service</p> <p>Brisbane City Council</p> <p>Queensland Government Department of State Development and Infrastructure</p>
<i>Impact of actions</i>	Unknown
<i>Gaps</i>	<p>Land available for restoration</p> <p>Low community political support for protection</p>
<i>Opportunities</i>	<p>Purchase land for protection and restoration</p> <p>Awareness raising within the general community and landholders</p>

### A.3.1.7. Mangroves

Value	Mangroves
<i>Description</i>	<p>Moreton Bay includes one of the most extensive intertidal areas of seagrass, mangrove and saltmarsh communities on the eastern coast of Australia. These areas provide habitat for fish, waterbirds and marine megafauna of conservation significance and support the many environmental, social, cultural and economic values, such as biodiversity and fish habitat for fisheries.<sup>28</sup></p> <p>The mangroves and saltmarshes of Moreton Bay comprise 18,400 ha.<sup>29</sup> The bay supports moderate mangrove plant community diversity, with 7 tree species present (range is 1-28 along coastal Australia). An increase in mangroves since 1955 has resulted from sediment infill from catchment inputs and encroachment into saltmarsh habitat (6.4%).<sup>29,30,31</sup></p> <p>The extent of seagrass and mangroves has been assessed by a range of programs. These include seagrass and mangrove assessments in the Ecosystem Health Monitoring Program,<sup>32</sup> seagrass mapping by Science under Sail Australia<sup>33</sup> and mangrove extent mapping by the Queensland Herbarium.<sup>34,35</sup> Most of these programs only assess extent and do not assess the condition of seagrass and mangroves or assess the fauna they support nor the services they provide. Additionally, the ongoing funding and co-ordination of</p>

<sup>28</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>29</sup> Lovelock C, Accad A, Dowling R, Duke N, Lee SY, Ronan M. (2019). Mangroves and saltmarshes of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>30</sup> McSweeney, S., Stout, J., Savige, T., (2021). Basin infill increases seaward sediment delivery in small, tide-dominated estuaries. Estuar Coast Shelf Sci 258. <https://doi.org/10.1016/j.ecss.2021.107441>

<sup>31</sup> Bennion, V., Dwyer, J.M., Twomey, A.J., Lovelock, C.E. (2024). Decadal Trends in Surface Elevation and Tree Growth in Coastal Wetlands of Moreton Bay, Queensland, Australia. Estuaries and Coasts. <https://doi.org/10.1007/s12237-024-01325-y>

<sup>32</sup> Healthy Land and Water (2024). Ecosystem Health Monitoring Program Website. Available at [www.hlw.org.au/portfolio/ecosystem-health-monitoring-program](http://www.hlw.org.au/portfolio/ecosystem-health-monitoring-program)

<sup>33</sup> Udy, J., B, Venables, E. Ovsyanikova, C. Sheidler. (2021). Spatial modelling of seagrass distribution in Moreton Bay. Science Under Sail Australia for Healthy Land and Water.

<sup>34</sup> Accad A, Li J, Dowling R, Guymer GP. (2016). Mangrove and associated communities of Moreton Bay, Queensland, Australia: change in extent 1955-1997-2012. Queensland Herbarium, Department of Science, Information Technology and Innovation.

<sup>35</sup> Healthy Land and Water, (2021). South East Queensland Natural Resource Management Plan: Story Map 2021 [WWW Document]. URL <https://storymaps.arcgis.com/stories/ad1933bb9fef4c2297f40747a33e7dd0> (accessed 1.9.24).

Value	Mangroves
	these programs is not certain. The threat of climate change (e.g. from sea level rise) to mangroves and seagrasses is largely unknown aside from isolated research projects. <sup>36</sup>
<i>State category (poor, fair, good, no data)</i>	<b>Mangrove: Good.</b> Based on 1955 benchmark.
<i>Trend category (declining, stable, improving, no data)</i>	<b>Mangrove: Improving.</b>
<i>Threats -Current Moreton Bay</i>	Coastal erosion Habitat removal and degradation Coastal development Pests and weeds Grazing Lack of clear legislative levers (SPP stormwater provisions, EPA WQO, Marine Parks Act restoration, Native Vegetation Act land clearing) Lack of private landholder awareness & care Limited legislation and lack of enforcement on private landholders Low political pressure from community
<i>Threats - Future Moreton Bay</i>	Sea level rise Rainfall / extreme events / flooding Coastal development Human and domestic animal disturbance Low understanding of trends
<i>Organisations acting on value or threats</i>	Healthy Land and Water Queensland Government Department of Environment (RAMSAR) Logan City Council Redland City Council Brisbane City Council (limited) Community groups
<i>Impact of actions</i>	Limited at the scale required. Habitat loss and degradation continues.
<i>Gaps</i>	Most of monitoring programs only assess extent and do not assess the condition of mangroves or assess the fauna they support nor the services they provide. Land available for restoration Low community political support for protection Mangroves are not considered degraded in general, however, they are potential target for active restoration, particularly in areas at risk of coastal erosion under future climate change scenarios
<i>Opportunities</i>	Develop a regional prioritisation for coastal habitat locations that require enhancement and protection Purchase land for protection and restoration Awareness raising within the general community and landholders Climate risk and vulnerability assessment

<sup>36</sup> Saunders, M. I. et al. (2013). Coastal retreat and improved water quality mitigate losses of seagrass from sea level rise. Glob. Change Biol. 19, 2569–2583

Value	Mangroves
	Mangroves are not considered degraded in general, however, they are potential target for active restoration, particularly in areas at risk of coastal erosion under future climate change scenarios

### A.3.1.8. Saltmarsh

Value	Saltmarsh
<i>Description</i>	<p>Moreton Bay includes one of the most extensive intertidal areas of seagrass, mangrove and saltmarsh communities on the eastern coast of Australia. These areas provide habitat for fish, waterbirds and marine megafauna of conservation significance and support the many environmental, social, cultural and economic values, such as biodiversity and fish habitat for fisheries.<sup>37</sup></p> <p>The mangroves and saltmarshes of Moreton Bay comprise 18,400 ha.<sup>38</sup> The bay supports high saltmarsh plant community diversity, with 20 saltmarsh species, representing 20% of total saltmarsh species across Australia. Saltmarsh ecosystems have shown a slight decline in extent over the past decade,<sup>39</sup> and historically saltmarsh has declined by 64% since 1955, predominantly due to human development or mangrove encroachment into saltmarsh habitats as a result of climate change.<sup>38,40</sup></p> <p>Sea level rise is predicted to affect saltmarsh habitat distributions. There is limited available habitat for saltmarsh migration along the shorelines of the Bay,<sup>41</sup> which in many cases is being squeezed against increasing urban development along the coastline.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Saltmarsh: Poor.</b> Based on 1955 benchmark
<i>Trend category (declining, stable, improving, no data)</i>	<b>Saltmarsh: Declining.</b>
<i>Threats -Current Moreton Bay</i>	<ul style="list-style-type: none"> <li>Coastal erosion</li> <li>Pests and weeds</li> <li>Habitat area width / extent decline</li> <li>Fragmentation / loss of habitat connectivity</li> <li>Mangrove encroachment</li> <li>Coastal development</li> <li>Grazing</li> <li>Lack of clear legislative levers (SPP stormwater provisions, EPA WQO, Marine Parks Act restoration, Native Vegetation Act land clearing)</li> <li>Lack of private landholder awareness &amp; care</li> <li>Limited legislation and lack of enforcement on private landholders</li> <li>Low political pressure from community</li> </ul>
<i>Threats - Future Moreton Bay</i>	<ul style="list-style-type: none"> <li>Temperature increase</li> <li>Rainfall / extreme events / flooding</li> </ul>

<sup>37</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>38</sup> Lovelock C, Accad A, Dowling R, Duke N, Lee SY, Ronan M. (2019). Mangroves and saltmarshes of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>39</sup> Healthy Land and Water, (2021). South East Queensland Natural Resource Management Plan: Story Map 2021 [WWW Document]. URL <https://storymaps.arcgis.com/stories/ad1933bb9fef4c2297f40747a33e7dd0> (accessed 1.9.24).

<sup>40</sup> McSweeney, S., Stout, J., Savige, T., (2021). Basin infill increases seaward sediment delivery in small, tide-dominated estuaries. Estuar Coast Shelf Sci 258. <https://doi.org/10.1016/j.ecss.2021.107441>

<sup>41</sup> Bennion, V., Dwyer, J.M., Twomey, A.J., Lovelock, C.E. (2024) Decadal Trends in Surface Elevation and Tree Growth in Coastal Wetlands of Moreton Bay, Queensland, Australia. Estuaries and Coasts. <https://doi.org/10.1007/s12237-024-01325-y>; McSweeney, S., Stout, J., Savige, T. (2021) Basin infill increases seaward sediment delivery in small, tide-dominated estuaries. Estuar Coast Shelf Sci 258. <https://doi.org/10.1016/j.ecss.2021.107441>

Value	Saltmarsh
	Coastal development Low understanding of trends
<i>Organisations acting on value or threats</i>	Healthy Land and Water Queensland Government Department of Environment, Science and Innovation (RAMSAR) Logan City Council Redland City Council Brisbane City Council (limited) Community groups
<i>Impact of actions</i>	Government policy and legislation to protect coastal habitats is provided at federal and state levels, however they continue to be lost. Current legislation does not provide protection against threats like sea-level rise, encroachment by other habitats (e.g. mangroves into saltmarshes) and urban squeeze that prevents coastal habitats from migrating as climatic conditions change. Limited at the scale required. Habitat loss and degradation continues.
<i>Gaps</i>	Planning and management on a large scale has not been initiated to reverse losses Land available for restoration Low community political support for protection
<i>Opportunities</i>	Purchase land for protection and restoration Awareness raising within the general community and landholders

### A.3.1.9. Seagrass

Value	Seagrass
<i>Description</i>	<p>Moreton Bay includes one of the most extensive intertidal areas of seagrass, mangrove and saltmarsh communities on the eastern coast of Australia. These areas provide habitat for fish, waterbirds and marine megafauna of conservation significance and support many environmental, social, cultural and economic values, such as biodiversity and fish habitat for fisheries.<sup>42</sup></p> <p>Seagrasses are a key intertidal and subtidal habitat in Moreton Bay. They are highly productive and return a disproportionate amount of services per area than most other estuarine habitats.<sup>43</sup></p> <p>The extent of seagrass and mangroves has been assessed by a range of programs. These include seagrass and mangrove assessments in the Ecosystem Health Monitoring Program,<sup>44</sup> seagrass mapping by Science under Sail Australia<sup>45</sup> and mangrove extent mapping by the Queensland Herbarium.<sup>46,47</sup> The regional extent of seagrass in 1998 was 27,085ha. In 2019 it was 22,695ha. However, changes in mapping techniques make it difficult to know the extent of seagrass against data from 1998. The Healthy Land and Water Report Card 2019 found evidence of some recovery of seagrass cover in Bramble Bay and</p>

<sup>42</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>43</sup> Maxwell P, Connolly R, Roelfsema C, Burfeind D, Udy J, O'Brien K, Saunders M, Barnes R, Olds A, Hendersen C, Gilby B . (2019). Seagrasses of Moreton Bay Quandamooka: Diversity, ecology and resilience. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>44</sup> Healthy Land and Water (2024). Ecosystem Health Monitoring Program Website. Available at [www.hlw.org.au/portfolio/ecosystem-health-monitoring-program](http://www.hlw.org.au/portfolio/ecosystem-health-monitoring-program)

<sup>45</sup> Udy, J., B, Venables, E, Ovsyanikova, C.Sheidler. (2021). Spatial modelling of seagrass distribution in Moreton Bay. Science Under Sail Australia for Healthy Land and Water.

<sup>46</sup> Accad A, Li J, Dowling R, Guymer GP. (2016). Mangrove and associated communities of Moreton Bay, Queensland, Australia: change in extent 1955-1997-2012. Queensland Herbarium, Department of Science, Information Technology and Innovation.

<sup>47</sup> Healthy Land and Water, (2021). South East Queensland Natural Resource Management Plan: Story Map 2021 [WWW Document]. URL <https://storymaps.arcgis.com/stories/ad1933bb9fef4c2297f40747a33e7dd0> (accessed 1.9.24).

Value	Seagrass
	<p>Deception Bay over this period, the result of a long period of dry, reduced catchment inputs and improved growing conditions.<sup>48,49</sup></p> <p>Seagrass depth range indicates the light and growth conditions of seagrass meadows, and there has been no significant change in average seagrass depth range since long-term monitoring began in Moreton Bay in 1999. There are however indications of declines in condition at select sites in Pumicestone Passage and Southern Moreton Bay since 2019.<sup>49,50</sup></p> <p>Historically poorly managed wastewater inputs resulted in algal blooms and loss of seagrass in the western side of the Bay, which was the catalyst for the Bay-wide water quality management strategy in the late 1990s and early 2000s.<sup>51</sup> Extensive clearing in the catchments that drain to the Bay since European settlement has led to significant sediment erosion which ends up discharging into the Bay following rainfall events and flooding.<sup>52,53</sup> Seagrass is a light dependent and nutrient sensitive ecosystem, as such catchment derived sediment represents one of the most significant threats, smothering near coastal seagrasses and creating poor water quality.<sup>54</sup> Future threats are the more frequent extreme rainfall events associated with climate change, reducing the length of time for recovery (before another event hits)<sup>55</sup> for seagrass, affecting long-term condition and survival. However, the broader threat of climate change is largely unknown aside from isolated research projects.<sup>56</sup></p>
<i>State category (poor, fair, good, no data)</i>	<b>Seagrass: Fair.</b> Based on 1998 benchmark.
<i>Trend category (declining, stable, improving, no data)</i>	<b>Seagrass: Variable</b> with floods.
<i>Threats -Current Moreton Bay</i>	<p>Catchment runoff - nutrient, toxicants</p> <p>Catchment runoff – sediments, causing smothering</p> <p>Current Water quality</p> <p>Coastal erosion</p> <p>Weeds / pests / disease / algal blooms</p> <p>Habitat area width / extent decline</p> <p>Fragmentation/ habitat connectivity</p>
<i>Threats - Future Moreton Bay</i>	<p>Sea level rise, reducing habitat availability</p> <p>Temperature increases</p> <p>Rainfall/extreme events / flooding</p> <p>Low understanding of trends</p>

<sup>48</sup> Healthy Land and Water, (2021). South East Queensland Natural Resource Management Plan: Story Map 2021 [WWW Document]. URL <https://storymaps.arcgis.com/stories/ad1933bb9fef4c2297f40747a33e7dd0> (accessed 1.9.24).

<sup>49</sup> Healthy Land and Water, (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>50</sup> Ecosystem Health Monitoring Program, (2023). WaterNav - Seagrass Depth Range [WWW Document]. URL <https://reportcard.hlw.org.au/deeper-dive-interactive-data-dashboards> (accessed 1.9.24).

<sup>51</sup> Saeck, E.A., O'Brien, K.R., Weber, T.R., Burford, M.A.,(2013). Changes to chronic nitrogen loading from sewage discharges modify standing stocks of coastal phytoplankton. *Mar Pollut Bull* 71, 159–167. <https://doi.org/https://doi.org/10.1016/j.marpollbul.2013.03.020>

<sup>52</sup> Lyons M, Phinn S, Roelfsema C. (2019). Moreton Bay and catchment urban expansion and vegetation change. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>53</sup> McSweeney, S., Stout, J., Savige, T., (2021). Basin infill increases seaward sediment delivery in small, tide-dominated estuaries. *Estuar Coast Shelf Sci* 258. <https://doi.org/10.1016/j.ecss.2021.107441>

<sup>54</sup> Saeck E, Udy J, Maxwell P, Grinham A, Moffatt D, Senthikumar S, Udy D, Weber T. (2019). Water quality in Moreton Bay and its major estuaries: Change over two decades (2000-2018). In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>55</sup> State of Queensland (2019). *Climate Change in the South East Queensland Region*. Department of Environment and Science.

<sup>56</sup> Saunders, M. I. et al. (2013). Coastal retreat and improved water quality mitigate losses of seagrass from sea level rise. *Glob. Change Biol.* 19, 2569–2583

Value	Seagrass
<i>Organisations acting on value or threats</i>	Council of Mayors – Resilient Rivers Initiative Queensland Government Department of Environment, Science and Innovation (EP Act) Local Councils (limited) Utilities (offsets) Port of Brisbane
<i>Impact of actions</i>	Research, monitoring and prioritization all completed for threat reduction Ineffectual at the current scale of the threat management
<i>Gaps</i>	Lack of strategy for Bay outcomes and lack of funding at scale for threat reduction Unknown opportunities for active restoration <sup>57</sup>
<i>Opportunities</i>	Research and trials into active restoration Advocacy for large scale sediment reduction that would impact bay Develop and co-ordinate a Bay-wide habitat restoration strategy

### A.3.1.10. Mudflat

Value	Mudflats
<i>Description</i>	Mudflats are diverse and productive ecosystems and are a valuable food source for fish and birds foraging in the Bay. <sup>58</sup> Intertidal mudflats and muddy sandflats are primarily concentrated in the western areas of the Bay, due to the input of terrigenous sediment from the major rivers into this area. <sup>59,60</sup> Mudflats are typically adjacent to mangrove forests. The area of mudflats currently covers 860km <sup>2</sup> of the Bay, which is estimated to be a 50% increase between 1970 and 2015. <sup>61,62,63</sup> The increase has been attributed to major weather events, including the 1974, 2011 and 2013 floods. <sup>64</sup>  A 2017 bay-wide study of mudflat macrofauna found that they are productive and moderately diverse. <sup>65</sup> While there was some evidence of impact by industry producing organic wastes (e.g. irrigated agriculture, animal husbandry, waste treatment and disposal), the study concluded that the diversity and ecological function (ecological processing of organic matter, nutrient cycling and food for predators) of mudflats was relatively stable and resilient across Moreton Bay.
<i>State category (poor, fair, good, no data)</i>	<b>Mudflats: Good.</b> Based on 1955 benchmark and a bay wide study of macrofauna 2016/2017 (Dissanayake et al., 2020)
<i>Trend category (declining, stable, improving, no data)</i>	<b>Mudflats: Stable.</b> Based on a bay wide study of health and function of mudflat macrofauna communities 2016/2017. <sup>65</sup> <b>Increasing,</b> based on assessment of area.

<sup>57</sup> E.g. Seagrass Restoration Network <https://seagrassrestorationnetwork.com/>

<sup>58</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>59</sup> Healthy Land and Water, (2021). South East Queensland Natural Resource Management Plan: Story Map 2021 [WWW Document]. URL <https://storymaps.arcgis.com/stories/ad1933bb9fef4c2297f40747a33e7dd0> (accessed 1.9.24).

<sup>60</sup> Healthy Land and Water, (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>61</sup> Maxwell, W.G.H., 1970. The sedimentary framework of Moreton Bay, Queensland. Mar Freshw Res 21, 71–88.

<sup>62</sup> Lockington, J.R., Albert, S., Fisher, P.L., Gibbes, B.R., Maxwell, P.S., Grinham, A.R., 2017. Dramatic increase in mud distribution across a large sub-tropical embayment, Moreton Bay, Australia. Mar Pollut Bull 116, 491–497. <https://doi.org/https://doi.org/10.1016/j.marpolbul.2016.12.029>

<sup>63</sup> Kovacs EM, Tibbetts HL, Baltais S, Lyons M, Loder J, Roelfsema C. (2019). Wetland and benthic cover changes in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>64</sup> McSweeney, S., Stout, J., Savage, T., (2021). Basin infill increases seaward sediment delivery in small, tide-dominated estuaries. Estuar Coast Shelf Sci 258. <https://doi.org/10.1016/j.ecss.2021.107441>

<sup>65</sup> Dissanayake, N.G., Frid, C.L.J., Caswell, B.A., (2020). Biodiversity, trait composition and ecological functioning: impacts of coastal urbanisation on subtropical mudflats. Mar Freshw Res 71, 1043–1061.

Value	Mudflats
<i>Threats - Current Moreton Bay</i>	Coastal erosion
<i>Threats - Future Moreton Bay</i>	Water quality
<i>Organisations acting on value or threats</i>	Queensland Parks and Wildlife Service (Moreton Bay Marine Park) Queensland Government Department of Environment, Science and Innovation (RAMSAR)
<i>Impact of actions</i>	Anecdotal concern remains regarding ecological impact of increased recreational use of intertidal mudflats associated with population increases
<i>Gaps</i>	Minimal capacity to manage recreational impacts on intertidal mudflats Understanding of the recreational impacts on intertidal mudflats
<i>Opportunities</i>	Research to quantify the impact of recreation on high-value coastal habitats, including mudflats

### A.3.1.11. Coral reefs

Value	Coral Reefs
<i>Description</i>	<p>Coral reefs of the Bay are both locally and regionally significant, delivering significant ecosystem services.<sup>66</sup> Coral reefs support important habitat for juvenile fish and other micro-benthic organisms which supports local recreational and commercial fisheries. In addition, Moreton Bay corals sits at the interface between the tropical coral communities and the populations further south. They are considered an important stepping stone to support the diversity of coral assemblages to the south.<sup>67</sup></p> <p>Coral reefs have declined significantly in the Bay since European arrival,<sup>68</sup> however the area cover of coral reefs in the Bay was estimated to have increased from 1724.7ha in 2004 to 1820ha in 2015/2016.<sup>69</sup> This suggests some hope in reversing the declining trend.</p> <p>Many of the coral reefs in the western and southern parts of the Bay have declined in condition or been lost altogether after being inundated by increased sedimentation and outcompeted by macroalgae. For the reefs that are left in the western part of the Bay, stress-tolerant, generalist, and opportunistic corals dominate.<sup>70</sup> Generally coral reefs in the Bay are characterised by high-latitude, marginal reefs due to the conditions of the environment, including poor water quality, lower temperatures, limited light, and more variable conditions relative to tropical coral reefs.<sup>68</sup> This favours an assemblage of stress-tolerant, generalist, and opportunistic corals with horizontally spreading morphology, such as the family <i>Merulinidae</i>.<sup>71</sup> Additionally, the corals of Moreton Bay do not favour reef building, like tropical reefs, but still provide important habitat for juvenile fish and other micro-benthic organisms which supports local fisheries.</p> <p>Catchment related sedimentation and rising sea temperatures are the two major threats to the Bay's corals. Extensive historical and continued clearing of the Bay's catchment causes sediment erosion during</p>

<sup>66</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>67</sup> Wallace CC, Fellegara I, Muir PR, Harrison PL. (2009). The scleractinian corals of Moreton Bay, eastern Australia: High latitude, marginal assemblages with increasing species richness *Memoirs of the Queensland Museum*. 54(2):1-118

<sup>68</sup> Pandolfi J, Lybolt M, Sommer B, Narayan R, Rachello-Dolmen P. (2019). Coral and micro-benthic assemblages from reef habitats in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>69</sup> Kovacs EM, Tibbetts HL, Baltais S, Lyons M, Loder J, Roelfsema C. (2019). Wetland and benthic cover changes in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>70</sup> Salmond J. & Schubert J. (2024). Reef Check Australia South East Queensland Season Summary Report 2022-2023. Reef Check Foundation Ltd, accessed 10 May 2024. Available at: [https://www.reefcheckaustralia.org/season\\_summary\\_report\\_seq\\_2022\\_2023](https://www.reefcheckaustralia.org/season_summary_report_seq_2022_2023)

<sup>71</sup> Sommer, B., Harrison, P., Beger, M., Pandolfi, J. (2014). Trait-mediated environmental filtering drives assembly at biogeographic transition zones. *Ecology* 95, 1000–1009.

Value	Coral Reefs
	<p>rainfall events and flooding<sup>72</sup>, smothering corals and reducing water quality. Rising sea temperatures led to coral bleaching in the summer of 2023–24, and such events are predicted to increase in future.</p> <p>Coral reef monitoring in Moreton Bay is conducted by Reef Check in partnership with the University of Queensland and Healthy Land and Water. The program is an excellent example of the contribution that citizen science can make to understanding changes to critical habitats.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Corals: Fair.</b> Based on Reef Check data.
<i>Trend category (declining, stable, improving, no data)</i>	<b>Corals: Improving or stable.</b>
<i>Threats - Current Moreton Bay</i>	<p>Catchment runoff - nutrient, toxicants</p> <p>Catchment runoff - sediments</p> <p>Current Water quality</p> <p>Weeds / pests / disease / algal blooms</p> <p>Habitat area width / extent decline</p> <p>Fragmentation/ habitat connectivity</p> <p>Harvesting / overfishing / extraction</p> <p>Low community awareness</p> <p>Lack of monitoring and understanding of trends</p>
<i>Threats - Future Moreton Bay</i>	<p>Sea level rise, reducing available habitat</p> <p>Temperature increases, bleaching</p> <p>Rainfall/extreme events / flooding</p>
<i>Organisations acting on value or threats</i>	<p>Queensland Government Department of Environment, Science and Innovation (RAMSAR)</p> <p>Queensland Parks and Wildlife Service (Moreton Bay Marine Park)</p> <p>Reef Check</p> <p>Health Land and Water</p>
<i>Impact of actions</i>	<p>Research to understand threats completed</p> <p>Ineffective threat reduction at the current scale of the threat management</p>
<i>Gaps</i>	Active restoration
<i>Opportunities</i>	<p>Conduct research and trials into restoration</p> <p>Restoration prioritisation</p> <p>Bay-wide restoration strategy</p> <p>Research to quantify the impact of recreation</p>

<sup>72</sup> Lyons M, Phinn S, Roelfsema C. (2019). Moreton Bay and catchment urban expansion and vegetation change. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

### A.3.1.12. Shellfish reefs

Value	Shellfish reefs
<i>Description</i>	<p>Shellfish reefs are a key habitat of the Bay and provide significant ecological health and social and cultural values. Sydney Rock Oysters (<i>Saccostrea glomerata</i>) are the most common species found in Moreton Bay. As adults, oysters inhabit coastal and estuarine environments, with sedentary filter-feeding lifestyles and a hard calcium carbonate shell. Like corals, they have a variety of valuable ecosystem services, including coastal protection, sediment stabilisation, water filtration, and reef-building.<sup>73</sup></p> <p>Sydney Rock Oyster reefs were historically abundant in the Bay, however, they have declined since the early 1900s. This decline has been attributed to overexploitation, extraction, disease and poor water quality, particularly sedimentation.<sup>74,75</sup> Harvests peaked at 1300 tonnes in 1891 but have since dwindled to approximately 66 tonnes of harvest in 2015-2016.<sup>73,76</sup> The decline has resulted in shellfish reefs becoming functionally extinct in Australia.<sup>77</sup> This decline is largely attributed to overexploitation of their meat for consumption and shells used in cement manufacturing. Sydney rock oyster populations are also affected by the QX disease caused by <i>Polydora</i> sp. worm infestations<sup>78</sup> and poor water quality in Moreton Bay<sup>74</sup>. Unlike marine plants (mangroves, seagrass, saltmarsh) and coral reefs, shellfish reefs have not been individually recognised for protection and management within Queensland’s marine parks.</p> <p>Shellfish reef restoration has been undertaken in Moreton Bay since 2017, with trials in Pumicestone Passage and more recently in Waterloo Bay and adjacent to the Port of Brisbane. This includes deployment of 50,000 Robust Oyster Baskets in a 10-year program run by the OzFish conservation charity. In 2019, the Moreton Bay Shellfish Reef Restoration Working Group was convened by Moreton Bay Marine Parks to provide advice and recommendations on an appropriate response to restoration initiatives.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Shellfish: Poor.</b> Based on research by the University of Queensland comparing to pre-European condition.
<i>Trend category (declining, stable, improving, no data)</i>	<b>Shellfish: Stable.</b>
<i>Threats -Current Moreton Bay</i>	<ul style="list-style-type: none"> <li>Water quality</li> <li>Harvesting / overuse</li> <li>Weeds / pests / disease / algal blooms, including <i>Polydora</i> sp. Infestations</li> <li>Habitat area width / extent decline</li> <li>Fragmentation / loss of habitat connectivity</li> <li>Coastal development / artificial coastlines</li> <li>Barriers for restoration projects in Marine Park legislation</li> <li>Low community connection</li> <li>Low community awareness</li> <li>Low community stewardship</li> <li>Lack of monitoring and understanding of trends</li> </ul>
<i>Threats - Future Moreton Bay</i>	<ul style="list-style-type: none"> <li>Sea level rise, reducing available habitat</li> <li>Temperature increases, bleaching</li> </ul>

<sup>73</sup> West E, Conacher C, Dexter J, Lee P, Heidenreich M, Paterson B. (2019). Aquaculture in Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>74</sup> Diggles, B.K., (2013). Historical Epidemiology Indicates Water Quality Decline Drives Loss of Oyster (*Saccostrea Glomerata*) Reefs in Moreton Bay. *N Z J Mar Freshwater Res* 47, 561–581.

<sup>75</sup> Tibbetts IR, Hall NJ, Dennison WC (Eds.) (1998). Moreton Bay and Catchment. The University of Queensland, School of Marine Sciences, Brisbane.

<sup>76</sup> Dexter, J., (2015). Oyster Industry Plan for Moreton Bay Marine Park. Department of Agriculture and Fisheries, Queensland Government. Available at: [https://parks.des.qld.gov.au/\\_data/assets/pdf\\_file/0036/166797/moreton-bay-oyster-management-plan.pdf](https://parks.des.qld.gov.au/_data/assets/pdf_file/0036/166797/moreton-bay-oyster-management-plan.pdf)

<sup>77</sup> Beck, M. W. , Brumbaugh, R. D. , Airoidi, L. , Carranza, A. , Coen, L. D. , Crawford, C. , Defeo, O. , Edgar, G. J. , Hancock, B. , Kay, M. C. , Lenihan, H. S. , Luckenbach, M. W. , Toropova, C. L. , Zhang, G. , & Guo, X. (2011). Oyster reefs at risk and recommendations for conservation, restoration, and management. *Bioscience*, 61(2), 107–116.

<sup>78</sup> Smith, G.S., (1981). Southern Queensland’s oyster industry. *Journal of the Royal Historical Society of Queensland* 11, 45–58.

Value	Shellfish reefs
	Rainfall/extreme events / flooding Increase in tropical disease prevalence
<i>Organisations acting on value or threats</i>	Queensland Government Department of Environment, Science and Innovation (RAMSAR) OzFish The Nature Conservancy Health Land and Water
<i>Impact of actions</i>	Shellfish reef restoration research and understanding is relatively advanced in Moreton Bay Restoration not yet a scale required for significant observable benefits
<i>Gaps</i>	Lack of whole of Bay strategy co-ordination and prioritization for restoration considering all the issues QPWS would need to look at The Moreton Bay Shellfish Reef Restoration Working Group and others have identified a need to streamline authorisations for undertaking marine habitat restoration works
<i>Opportunities</i>	Research to support bay-wide restoration prioritisation Bay-wide restoration strategy Advocacy for introducing restoration guidelines for reef restoration

### A.3.1.13. Groundwater dependent ecosystems

Value	
<i>Description</i>	<p>Groundwater dependent ecosystems across Moreton Bay include freshwater wetlands such as peat swamps, clay pans, window water-table lakes, perched lakes, freshwater creeks. Many groundwater dependent ecosystems on Moreton Bay islands have significant Traditional Owner cultural value. Wallum habitats are an important groundwater dependent ecosystem in the region, comprising of streams, lagoons, and wet heath communities.</p> <p>The health of these systems is linked to groundwater supply (rate and condition) which is affected by rainfall recharge, evaporation, sub-surface infiltration and groundwater flows. Groundwater extraction, land-use changes and climate change can place pressure on the hydrology of these habitats.<sup>79</sup></p> <p>Moreton Bay also receives large submarine groundwater discharge that is at a rate estimated to be 18 times higher than annual average discharge of all the major river inputs to the Bay.<sup>80</sup> This is understood to be a large source of dissolved carbon to Bay, and influences Bay productivity.<sup>79</sup></p>
<i>State category (poor, fair, good, no data)</i>	<b>Fair</b> on Minjerribah (North Stradbroke Island) and Moorgumpin (Moreton Island).
<i>Trend category (declining, stable, improving, no data)</i>	<b>Unknown</b>
<i>Threats -Current Moreton Bay</i>	Human disturbance Water quality Urbanisation pressure on coastal wetlands Pests and weeds Groundwater extraction

<sup>79</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>80</sup> Stewart, B. T., Santos, I. R., Tait, D. R., Macklin, P. A., & Maher, D. T. (2015). Submarine groundwater discharge and associated fluxes of alkalinity and dissolved carbon into Moreton Bay (Australia) estimated via radium isotopes. *Marine Chemistry*, 174, 1-12.

Value	
<i>Threats - Future Moreton Bay</i>	Sea level rise Drought
<i>Organisations acting on value or threats</i>	Queensland Government Department of Environment, Science and Innovation (RAMSAR) Seqwater Traditional Owners
<i>Impact of actions</i>	Relatively well managed Relatively well researched
<i>Gaps</i>	Unknown
<i>Opportunities</i>	Potentially some research Potentially some restoration

## A.3.2. Coastal living

### A.3.2.1. Natural beauty (including scenic amenity and water quality)

Value	Natural beauty (including scenic amenity and water quality)
<i>Description</i>	<p>The physical appeal and natural beauty of Moreton Bay is highly valued by many, and for boaters natural beauty is one of the highest values.<sup>81,82</sup> Aesthetic qualities that are valued include: the colours (the blues and beiges of the Bay, the pinks and purples of the sunsets and sunrises); the flora and fauna; the unique perspective when looking back at land when out on the water; the clarity of the water; picturesque scenery (rocky headlands, sandy beaches, cliffs); and mangrove forest backdrop when boating/kayaking.</p> <p>Water quality is one key element of aesthetics. When compared with the water quality of coastal systems alongside other large cities around the world, Moreton Bay water quality is relatively good<sup>83,84</sup> and the HLW Report Card reports<sup>85</sup> it to be in very good to excellent condition. Algal blooms which occur at various times and locations across the Bay also affect scenic amenity. For example, blooms of the filamentous cyanobacteria <i>Lyngbya majuscula</i>, the brown algae <i>Hincksia sordida</i>, and green algae <i>Ulva lactucam</i> have all been reported in high densities on inshore beaches at times in the last few decades. Phytoplankton blooms are also present on occasion, such as <i>Trichodesmium</i>, causing water discolouration and the appearance of pollution slicks.</p> <p>Surveys in South East Queensland indicate people place high value on intimate views of natural waterways, with top-rating scenes being ocean, rocks, white sand and natural coastal vegetation without any evident development. Scenic amenity is protected in State Planning Policy and acknowledged in local government planning, the intention of which is to maintain or enhance the scenic amenity of regionally important natural coastal landscape features, views and vistas.<sup>86</sup></p> <p>Scenic amenity and nature-based experiences are cited as some of the key reasons that the community value Moreton Bay.<sup>81,87,88</sup> For example, 21 of the 30 non-Indigenous participants in a study of the Bay's values mentioned aesthetic values.<sup>70</sup> In a study of recreational boaters use and values the Bay,</p>

<sup>81</sup> Martin, V., (2023). Recreational Boaters' Use and Values of Moreton Bay 2022. Brisbane.

<sup>82</sup> Martin, V., Klein, C., Benham, C., Crowe, B., (2024). Mapping social values of Moreton Bay [WWW Document]. URL <https://storymaps.arcgis.com/stories/5ea4883393dc47a0a17e96d652e6a8ab> (accessed 4.25.24).

<sup>83</sup> Cloern, J.E., Foster, S.Q., Kleckner, A.E., (2014). Phytoplankton primary production in the world's estuarine-coastal ecosystems. *Biogeosciences* 11, 2477–2501.

<sup>84</sup> Dunn, R.J.K., Doriean, N.J.C., Bennett, W.W., Welsh, D.T., Purandare, J., Tomlinson, R.B., (2022). Baseline water quality of the Gold Coast Broadwater, southern Moreton Bay (Australia). *Mar Pollut Bull* 185, 114234. <https://doi.org/https://doi.org/10.1016/j.marpolbul.2022.114234>

<sup>85</sup> Healthy Land and Water (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>86</sup> Queensland Government (2018). Determining scenic preference in the coastal zone: Guideline for coastal development. Brisbane.

<sup>87</sup> Jones NA, Ross H, Shaw S, Witt K, Pinner B, Rissik D. (2016) Values towards waterways in south east Queensland: Why people care. *Marine Policy*. 71:121–31

<sup>88</sup> Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J.. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

Value	Natural beauty (including scenic amenity and water quality)
	<p>'appreciating the natural beauty of this place (overall beauty of the area, or of specific things e.g., lovely sunrises, beautiful fish)' was selected by 98% of respondents, making it the most selected value type by the 304 recreational boaters in the study.<sup>69</sup> The same study also found 'experiencing nature (e.g. seeing wildlife, exploring the natural world)' was the second most frequently selected value for 91% of respondents. These studies also noted that Indigenous and non-Indigenous peoples express scenic amenity differently; while both Indigenous and non-Indigenous people appreciate the beauty of the Bay in the present, non-Indigenous people also consider the beauty of the past, and lament its decline. The characteristics that drive aesthetic and nature experiences values have not yet been prioritised for guiding the management of these experiences. More needs to be done to understand what aspects of scenic amenity and nature-based experiences are important to improve or preserve for people in the Bay.</p>
<p><i>State category</i> (poor, fair, good, no data)</p>	<p><i>Scenic amenity:</i> <b>Fair</b>, based on SEQ NRM Plan Atlas assessment.</p> <p><i>Water quality:</i> <b>Unknown</b>. Data available based on Ecosystem Health Monitoring Program (2022), however no benchmark for natural beauty has been defined.</p>
<p><i>Trend category</i> (declining, stable, improving, no data)</p>	<p><i>Scenic amenity:</i> <b>Unknown</b>, limited current data.</p> <p><i>Water quality:</i> <b>Stable</b>, based on Healthy Land and Waters 2023 Report Card. <b>Variable</b> year to year in the Western areas of the Bay, related to high rainfall/flood years.</p>
<p><i>Threats -Current Moreton Bay</i></p>	<p>Community perception that the Bay is in poor condition</p> <p>Catchment runoff - nutrient, toxicants</p> <p>Catchment runoff - sediments</p> <p>Current Water quality</p> <p>Litter / microplastics</p> <p>Coastal erosion</p> <p>Weeds / pests / disease / algal blooms</p> <p>Habitat area width / extent decline</p> <p>Fragmentation/ habitat connectivity</p> <p>Coastal development / artificial coastlines, specifically development within 500m of coast or bank of a waterway</p> <p>Low community awareness</p> <p>Lack of data/knowledge</p>
<p><i>Threats - Future Moreton Bay</i></p>	<p>Sea level rise reducing available habitat</p> <p>Extreme events/ flooding</p>
<p><i>Organisations acting on value or threats</i></p>	<p>Queensland tourism</p> <p>Healthy Land and Water (SEQ NRM Plan)</p> <p>Council of Mayors (Resilient Rivers Initiative)</p> <p>Local Councils</p>
<p><i>Impact of actions</i></p>	<p>Very little action except at a site-based level (development approval scale)</p>
<p><i>Gaps</i></p>	<p>Catchment scale improvements and impacts on the Bay</p> <p>An issue not really being considered in any management plans or strategies at a bay-wide scale</p>
<p><i>Opportunities</i></p>	<p>Raise awareness about the Bays values and unique environment</p> <p>Research to understand the opportunities to improve scenic amenity at bay-wide scale and prioritise locations to protect scenic amenity</p> <p>Partnership with Council of Mayors on advocacy and capacity building (training program)</p>

### A.3.2.2. Coastal community protection (flooding, storm tide, erosion, sea level rise)

Value	Coastal community protection (inundation, storm tide, erosion, sea level rise)
<i>Description</i>	<p>Coastal communities throughout Moreton Bay are at risk from open coast erosion and regular or permeant inundation, as a result of development, climate change and sea level rise. Coastlines naturally erode and accrete periodically over time, driven by sediment supply, tidal currents and waves. Development too close to the shore, climate change, sea level rise and changes in sediment supply can affect these natural processes. Coastal Hazard Adaptation Strategies developed for local government areas (e.g. City of Moreton Bay, City of Gold Coast, Redlands City Council) have identified current and increasing future risks to homes, businesses, infrastructure, utilities networks, places for walking, exercising and recreation, and environmentally significant locations (such as turtle nesting habitat).<sup>89,90,91</sup></p> <p>Protecting, enhancing and restoring native vegetation across the coast, wetlands and estuaries is an important adaptation action for coastal community protection. The ‘living shorelines’ concept is an approach to offshore energy dissipation using a suite of erosion control techniques that combine natural coastal habitats with a natural or engineered means of breaking up wave energy (e.g. mangrove islands, oyster farm reefs or breakwater).</p> <p>Under current conditions all of the Bay’s coastal communities have a good level of resilience to present day storm tide, erosion and tidal inundation for all but the scenario of a low tracking cyclone causing really extreme waves and storm tide. Current protection is from significant hard protection structures around developed areas of the Bay offering protection to key areas for present day conditions. However, it is not feasible for any council in this region (with maybe the exception of Brisbane) to continue to maintain the current hard structures and upgrade/expand those to provide the required increasing level of protection to deal with increasing tidal and storm tide inundation predicted with sea level rise. For this reason all Councils in the region are progressing into nature-based solution i.e. ‘living shorelines’.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Good.</b> Based on current conditions as identified in a series of local and state government commissioned Coastal Hazard Adaptation Strategies (2016 to present).
<i>Trend category (declining, stable, improving, no data)</i>	<b>Declining.</b> Based on future predicted trends identified in a series of local and state government commissioned Coastal Hazard Adaptation Strategies (2016 to present). However, predicted to become stable or improve, as Council’s progress move towards nature-based ‘living shoreline’ solutions.
<i>Threats -Current Moreton Bay</i>	<ul style="list-style-type: none"> <li>Coastal erosion</li> <li>Storms and cyclones</li> <li>Development</li> <li>Loss of natural habitat</li> <li>Community perception of the risk of using natural solutions vs. engineered structures</li> <li>Low community support for perceived loss of scenic amenity for natural solutions</li> </ul>
<i>Threats - Future Moreton Bay</i>	<ul style="list-style-type: none"> <li>Sea level rise</li> <li>Flood intensity and frequency</li> <li>Storm and cyclone intensity and frequency</li> <li>Low community awareness</li> <li>Low community stewardship</li> </ul>
<i>Organisations acting on value or threats</i>	<ul style="list-style-type: none"> <li>City of Moreton Bay</li> <li>Redlands City Council</li> <li>City of Gold Coast</li> <li>Brisbane City Council</li> </ul>

<sup>89</sup> Redland City Council (2021). Coastal Hazard Adaptation Strategy. Report by Alluvium for Redland City Council. Available at <https://yoursay.redland.qld.gov.au/CHAS>

<sup>90</sup> Moreton Bay Regional Council (2023). Moreton Bay’s Living Coast Plan 2023. Available at <https://yoursay.moretonbay.qld.gov.au/coastal-hazard-adaptation-strategy>

<sup>91</sup> City of Gold Coast (2021). Coastal Adaptation Plan. Available at <https://www.goldcoast.qld.gov.au/Council/Future-plans-budget/Plans-policies-strategies/Our-plans/Coastal-Adaptation-Plan>

Value	Coastal community protection (inundation, storm tide, erosion, sea level rise)
<i>Impact of actions</i>	Adaptation options have been identified via local government Coastal Hazard Adaptation Strategies
<i>Gaps</i>	Community awareness, perception & support for non-hard structure solutions Available land for protection/restoration Demonstration studies that show case effectiveness of nature-based solutions
<i>Opportunities</i>	Natural environment restoration partnerships with Local Councils in priority CH areas to achieve multiple benefits (including CHA) Community awareness campaign to increase local support for natural (i.e. living shoreline) adaptation solutions Research and trials into active restoration Develop and co-ordinate a Bay-wide habitat restoration strategy

### A.3.3. Traditional Owner cultural values

Value	Traditional Owner cultural values
<i>Description</i>	<p>Moreton Bay is the traditional home of the Quandamooka and Kabi Kabi peoples. For over 25,000 years these lands are recognised for the cultural services it has provided the Quandamooka people. This includes spiritual and aesthetic services and improving human wellbeing. There are long standing spiritual and cultural obligations and tradition law and customs in respect to lands and waters.<sup>92,93,94,95</sup></p> <p>Specifically, as reported in Fischer et. al.,<sup>93</sup> Quandamooka People have recognised Native Title rights and interests over 54,408ha of land and sea in the Moreton Bay area. Under Native Title, rights include the right to: conduct ceremonies; maintain places of significance, teach on the area about the physical and spiritual attributes; take, use, share and exchange traditional natural resources and seawater for any non-commercial purpose.</p> <p>Cultural heritage sites in Moreton Bay and Islands managed by a Cultural Heritage Management Plan have increased over the last two decades, however remain low at &lt;20% for all of SEQ which includes large areas of Moreton Bay.<sup>96</sup> While this does not demonstrate condition or trend in condition of cultural services, it indicates the level of protection and active management to many culturally significant sites of Moreton Bay is likely low and the resilience of cultural services into the future may be compromised.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Not rated</b>
<i>Trend category (declining, stable, improving, no data)</i>	<b>Not rated</b>
<i>Threats - Current Moreton Bay</i>	Coastal erosion Weeds and pests Habitat extent decline Urbanisation and coastal development

<sup>92</sup> QYAC (2022). Strategic Plan 2022-2026. Available at [http://qyac.net.au/docs/QYAC\\_Strategic\\_Plan\\_2022-2026.pdf](http://qyac.net.au/docs/QYAC_Strategic_Plan_2022-2026.pdf)

<sup>93</sup> Fischer M, Burns D, Bolzenius J, Costello C, Low Choy D. (2019). Quandamooka Country: The role of science and knowledge in Traditional Owner-led land and sea management. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>94</sup> Moreton Bay Regional Council (2023). Moreton Bay's Living Coast Plan 2023. Available at <https://yoursay.moretonbay.qld.gov.au/coastal-hazard-adaptation-strategy>

<sup>95</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis Ramsar.org/> <https://rsis Ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>96</sup> Healthy Land and Water (2022) Report Card Cultural Indicators. Available at: <https://reportcard.hlw.org.au/cultural-indicators>

Value	Traditional Owner cultural values
	<p>Economic opportunities</p> <p>Threats to individual sites</p> <p>Bushfire</p> <p>Groundwater extraction (impacts on culturally significant groundwater dependent ecosystems)</p> <p>Low awareness and stewardship in the broader community</p>
<i>Threats - Future Moreton Bay</i>	<p>Coastal erosion</p> <p>Coastal development</p> <p>Sea level rise, reducing available habitat</p> <p>Flood intensity and frequency</p> <p>Drought</p>
<i>Organisations acting on value or threats</i>	<p>MMEIC</p> <p>QYAC</p> <p>Local Government</p> <p>Research Organisations (University of Queensland, Griffith University)</p> <p>Healthy Land &amp; Water</p>
<i>Impact of actions</i>	<p>Research partnerships between Traditional Owner organisations and research institutes</p>
<i>Opportunities</i>	<p>Support Traditional Owner programs (more detail may be made available with permission from MMEIC)</p> <p>Align regional programs with Traditional Owner programs and priorities (e.g. MMEIC and QYAC)</p> <p>Research focused on MMEIC, QYAC and Kabi Kabi research priorities.<sup>97, 98</sup></p> <p>Aboriginal youth mentoring integrated into all Moreton Bay related activities</p> <p>Economic capacity building</p>

## A.3.4. Community connection and stewardship

### A.3.4.1. Community connection, stewardship

Value	Community connection, stewardship
<i>Description</i>	<p>Communities value Moreton Bay through a connection with this natural space, feeling an emotional bond, an appreciating it for its beauty, as a place to experience nature, to socialise with friends and family and for rest a relaxation. These emotional connections are developed through family heritage; living, working or socialising along a given waterway; or associating it with a significant or memorable life experience.<sup>99,100,101</sup></p> <p>Communities who are connected with natural spaces, such as Moreton Bay, have a heightened sense of its value and increased stewardship towards its protection.<sup>102,103</sup> Here we define stewardship as: the willingness and capacity for “individuals, organisations and industry to actively manage and value Moreton Bay; to remove, avoid or minimise negative impacts and proactively restore or conserve ecological health of associated waterways, wetlands and aquatic and marine environments”. For individuals this may</p>

<sup>97</sup> Quandamooka Yoolooburrabee Aboriginal Corporation, (2019). QYAC Research Priorities (version 2).

<sup>98</sup> Klein, C., Lovelock, C., Pandolfi, J., Riginos, C., Albert, S., (2021). Sustainable Urban Seascapes - Moreton Bay: Stakeholder Workshop Summary (27 August 2021). Brisbane.

<sup>99</sup> Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J.. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>100</sup> Healthy Land and Water, (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>101</sup> Martin, V., (2023). Recreational Boaters' Use and Values of Moreton Bay 2022. Brisbane.

<sup>102</sup> Dean, A.J., Fielding, K.S., Newton, F.J., (2016). Community Knowledge about Water: Who Has Better Knowledge and Is This Associated with Water-Related Behaviors and Support for Water-Related Policies? PLoS One 11, e0159063-.

<sup>103</sup> Dean, A. J., Uebel, K., Schultz, T., Fielding, K. S., Saeck, E., Ross, H., & Martin, V. (2024). Community stewardship to protect coastal and freshwater ecosystems—pathways between recreation and stewardship intentions. People and Nature.

Value	Community connection, stewardship
	<p>include picking up rubbish, participating in community events, talking with friends and family about the value of Moreton Bay, signing petitions, donating funds or time, writing to or speaking with local politicians.</p> <p>Connection and stewardship towards local waterways, varies across South East Queensland residents but on average, 85% of individuals (over 18 years) who live on or close to Moreton Bay report high levels of satisfaction with their experiences of the Bay and 75% report they are motivated to use and protect their local waterways to some degree.<sup>100</sup> However, this data does not indicate to what extent motivation is translated into action, and prior surveys indicate barriers to action result in much lower action than motivation may suggest.</p> <p>To date, there is no identifiable trend to suggest connection is significantly increasing or declining.<sup>104</sup></p>
<i>State category (poor, fair, good, no data)</i>	<b>Connection: Fair.</b> Based on Healthy Land and Water’s social survey data results 2016 to 2023. <sup>104</sup>
	<b>Stewardship: Unknown.</b> Difficult to reliably measure. Varies within the community from individuals who are “champions” to those how are “disengaged”. <sup>105</sup>
<i>Trend category (declining, stable, improving, no data)</i>	<b>Connection: Stable.</b> Based on basic analysis of Healthy Land and Water’s social survey data. <sup>104</sup> Trends are under review by Healthy Land and Water, but available at the time of publishing.
	<b>Stewardship: Stable.</b> Based on basic analysis of Healthy Land and Water’s social survey data. <sup>104</sup>
<i>Threats -Current Moreton Bay</i>	<ul style="list-style-type: none"> <li>Pollutants</li> <li>Lack of knowledge about the Bay’s unique values</li> <li>Lack of willingness or ability to contribute</li> <li>Lack of opportunities to contribute in different ways</li> <li>Community perception that the Bay is in poor condition</li> </ul>
<i>Threats - Future Moreton Bay</i>	<ul style="list-style-type: none"> <li>Increasing population/development related declines in scenic amenity or recreational access</li> <li>Climate impacts on quality and extent of coastal habitats and ecosystem health</li> <li>Coastal development and associated decline in natural habitat and condition</li> <li>Overuse reducing the quality of experience</li> </ul>
<i>Organisations acting on value or threats</i>	<ul style="list-style-type: none"> <li>Community groups</li> <li>Local councils</li> <li>School education programs (e.g. EcoMarines, Moreton Bay Education Centre)</li> </ul>
<i>Impact of actions</i>	Very little impact
<i>Gaps</i>	Few programs to build knowledge
<i>Opportunities</i>	<ul style="list-style-type: none"> <li>Research to identify opportunities to strengthen community connection to the Bay</li> <li>Develop an education and engagement campaign that showcases the Bay’s values and unique ecosystems</li> <li>Develop an education program that integrates with the primary and secondary school curriculum</li> <li>Fundraising campaign</li> </ul>

<sup>104</sup> Tsoi, I., Castiglione, M., Guimaraes, D., Dean, A., Schultz, T., (2023). SocialNav: Social and Economic Waterway Benefits 2016-2023 data visualisation [WWW Document]. Healthy Land and Water. URL <https://app.powerbi.com/view?r=eyJrjoiODk3Njg1ODctODMwMi00YmYxLTlmZDItYmYzNDk5NzQ4Mjg0IiwidCI6IjIyZVZlTl0LWVjYtQ0tNDkNS1hZjdjLTg5MmFiNTM3Y2ZlZCJ9> (accessed 4.25.24).

<sup>105</sup> Dean, A. and Shultz, T., (2023). Community understanding and appreciation of Moreton Bay – a framework to support engaging communities. Report to the Moreton Bay Foundation.

### A.3.4.2. Wellbeing, identity

Value	Wellbeing, identity
<i>Description</i>	<p>Moreton Bay is valued for the contribution to wellbeing and sense of identity for individuals and the local community.<sup>106,107</sup> Wellbeing can be nurtured through various pathways, including:</p> <ul style="list-style-type: none"> <li>• recreation activities such as boating, fishing, swimming and walking promoting physical health and mental and emotional wellbeing;<sup>108,109</sup></li> <li>• spending time in nature reducing stress, anxiety, and depression;<sup>110</sup></li> <li>• tranquil landscapes and scenic views providing opportunities for relaxation and contemplation.</li> </ul> <p>Moreton Bay also plays a role in shaping the identity of local communities and individuals, serving as a source of cultural pride and heritage. For Traditional Owners the Bay holds spiritual and cultural significance, representing ancestral connections and traditional practices.<sup>111,112</sup> For residents living on or by the bay, it serves as a focal point for community gatherings, festivals, and recreational activities, strengthening social bonds and fostering a sense of belonging. By engaging with Moreton Bay's natural and cultural resources, individuals develop a greater appreciation for their environment and heritage, contributing to a stronger sense of identity and connection to place.<sup>113</sup></p>
<i>State category (poor, fair, good, no data)</i>	<b>No data</b>
<i>Trend category (declining, stable, improving, no data)</i>	<b>No data</b>
<i>Threats - Current Moreton Bay</i>	<p>Lack of knowledge about the Bay's unique values</p> <p>Community perception that the Bay is in poor condition</p> <p>Lack of satisfaction with ability to 'use' the Bay the way the want to</p> <p>Pollutants</p>
<i>Threats - Future Moreton Bay</i>	<p>Overuse degrading satisfaction with experience</p> <p>Increasing population/coastal development related declines in scenic amenity or recreational access</p> <p>Climate impacts on quality and extent of coastal habitats and ecosystem health</p>
<i>Organisations acting on value or threats</i>	<p>QYAC</p> <p>MMEIC</p> <p>Local Government</p> <p>Community groups</p> <p>Local councils</p> <p>School education programs (e.g. EcoMarines, Moreton Bay Education Centre)</p>

<sup>106</sup> Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S., Grasso, M., 2017. Twenty years of ecosystem services: How far have we come and how far do we still need to go? *Ecosyst Serv* 28, 1–16. <https://doi.org/https://doi.org/10.1016/j.ecoser.2017.09.008>

<sup>107</sup> Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>108</sup> Martin, V., (2023). *Recreational Boaters' Use and Values of Moreton Bay 2022*. Brisbane.

<sup>109</sup> Martin, V., Klein, C., Benham, C., Crowe, B., (2024). Mapping social values of Moreton Bay [WWW Document]. URL <https://storymaps.arcgis.com/stories/5ea4883393dc47a0a17e96d652e6a8ab> (accessed 4.25.24).

<sup>110</sup> Johnson, K., Beatson, A., (2015). *Annual Social Survey*. Report for Healthy Land and Water, Brisbane.

<sup>111</sup> Fischer M, Burns D, Bolzenius J, Costello C, Low Choy D. (2019). Quandamooka Country: The role of science and knowledge in Traditional Owner-led land and sea management. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>112</sup> Kingsley, J., Townsend, M., Henderson-Wilson, C., Bolam, B., 2013. Developing an Exploratory Framework Linking Australian Aboriginal Peoples' Connection to Country and Concepts of Wellbeing. *Int J Environ Res Public Health* 10, 678–698. <https://doi.org/10.3390/ijerph10020678>

<sup>113</sup> Jones, N.A., Ross, H., Shaw, S., Witt, K., Pinner, B., Rissik, D., (2016). Values towards waterways in south east Queensland: Why people care. *Mar Policy* 71. <https://doi.org/10.1016/j.marpol.2016.05.027>

Value	Wellbeing, identity
<i>Impact of actions</i>	Unknown
<i>Opportunities</i>	<p>Develop an education and engagement campaign that showcases the Bay's values and unique ecosystems</p> <p>Develop an education program that integrates with the primary and secondary school curriculum</p> <p>Natural environment restoration partnerships with Local Councils for multiple benefits (social, economic, environmental)</p> <p>Align regional programs with Traditional Owner programs and priorities (e.g. MMEIC, QYAC and Kabi Kabi)</p> <p>Aboriginal youth mentoring integrated into all Moreton Bay related activities</p>

### A.3.4.3. Exploration, discovery for young people

Value	Exploration, discovery for young people
<i>Description</i>	Moreton Bay is valued as a place of exploration, discovery, and learning. Rich in biodiversity, cultural heritage, and history, the Bay presents many opportunities to explore and learn through structured and unstructured experiences. Outdoor learning is a core value of the Australian curriculum and is becoming increasingly important as experiences of nature are becoming more restricted in increasingly dense urban landscapes with minimal opportunity for exposure to natural and novel environments. In this context, the Bay provides a place for novel nature-based experiences and learning and the benefits associated with these experiences. <sup>114,115,116 117</sup>
<i>State category (poor, fair, good, no data)</i>	<b>Poor.</b> Based on Healthy Land and Water's social survey measures of water literacy in South East Queensland. <sup>114,118</sup>
<i>Trend category (declining, stable, improving, no data)</i>	<b>Stable.</b> Based on Healthy Land and Water's social survey measures of water literacy indicating no evidence of significant change since first assessed in 2015. <sup>118</sup>
<i>Threats -Current Moreton Bay</i>	<p>Lack of knowledge about the Bays values</p> <p>Lack of willingness or ability to contribute</p> <p>Community perception that bay is in poor condition</p> <p>Pollutants</p>
<i>Threats - Future Moreton Bay</i>	<p>Overuse degrading the naturalness of the nature-based experience</p> <p>Increasing population/development related declines in natural beauty and scenic amenity</p> <p>Climate impacts on quality and extent of coastal habitats and ecosystem health</p>
<i>Organisations acting on value or threats</i>	<p>EcoMarines</p> <p>MMEIC</p> <p>QYAC</p> <p>Queensland Government Department of Education</p>

<sup>114</sup> Johnson, K., Beatson, A., (2015). Annual Social Survey. Report for Healthy Land and Water, Brisbane.

<sup>115</sup> Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J.. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>116</sup> Martin, V., Klein, C., Benham, C., Crowe, B., (2024). Mapping social values of Moreton Bay [WWW Document]. URL <https://storymaps.arcgis.com/stories/5ea4883393dc47a0a17e96d652e6a8ab> (accessed 4.25.24).

<sup>117</sup> Dean, A. and Shultz, T., (2023). Community understanding and appreciation of Moreton Bay – a framework to support engaging communities. Report to the Moreton Bay Foundation.

<sup>118</sup> Tsoi, I., Castiglione, M., Guimaraes, D., Dean, A., Schultz, T., (2023). SocialNav: Social and Economic Waterway Benefits 2016-2023 data visualisation [WWW Document]. Healthy Land and Water. URL <https://app.powerbi.com/view?r=eyJrjoiODk3Njg1ODctODMwMi00YmYxLTlmZDItYmYzNDk5NzQ4Mjg0liwidCI6JlI2YzVIZTI0LWVjYTQtNDkNS1hZjdjLTg5MmFiNTM3Y2ZlZCJ9> (accessed 4.25.24).

<b>Value</b>	Exploration, discovery for young people
<i>Impact of actions</i>	Existing programs effective and growing
<i>Gaps</i>	No bay specific education programs at bay scale Nothing formally in curriculum No co-ordination of data collection as part of tertiary training
<i>Opportunities</i>	Education program support for EcoMarines and Traditional Owner cultural awareness education programs Tertiary training program Develop an education and engagement campaign that showcases the Bay’s values and unique ecosystems Develop an education program that integrates with the primary and secondary school curriculum Aboriginal youth mentoring integrated into all Moreton Bay related activities

### A.3.5. Sustainable use of ecosystems

#### A.3.5.1. Fisheries

<b>Value</b>	Fisheries
<i>Description</i>	<p>Fishing in Moreton Bay is an important, long-standing tradition for the Nughi, Noonuccall, and Dandrubin-Gorenpul peoples who have harvested crustaceans, shellfish, finned fishes, and dugong for generations.<sup>119</sup> The region also supports one of the most productive fisheries in Queensland. Although the Bay only represents about 3% of Queensland’s coastline, it produces just over 15% of the seafood for Queensland managed fisheries. The total value of commercial fishery production in the Bay is estimated to be \$24-30 million.<sup>120,121</sup></p> <p>Quota units are used in commercial fisheries across Australia to manage the sustainability of fish stocks, improve catch rates, and profitability by reducing competition. Since 1988, commercial fisheries in Queensland have also been required to use logbooks to record daily catch, effort and biological data (e.g. length, age, and sex) of key fish species.<sup>122</sup> This data has been utilised by the Queensland Government Department of Agriculture and Fisheries to inform and develop sustainable management plans for the long-term health of fish stocks.</p> <p>Since European occupation, many generations of overfishing has led to depleted fish stocks and strong selection pressure against larger, slow-reproducing species such as snapper. There has, however, been sufficient research, monitoring, and regulation of popular species and their threats to sustain these fish stocks within the Bay. Increasing the area of no-take zones in the marine national park from 0.5% to 16% in 2009 sought to protect species and enhance their long-term sustainability. Notably, snapper abundances and catch rates increased two years after the establishment of the New green zones in the Bay.<sup>123</sup> However, there is a clear lack of information of less popular species and the sustainability of their populations.</p> <p>Moreton Bay mangroves, saltmarsh and seagrass communities provide important primary production for a range of species, including commercially valuable fish and crab species. Threats to these habitats therefore also affect the fish stocks and fisheries of commercial, recreational and cultural value in the Bay.</p>

<sup>119</sup> Ross, A., Tomkins, H., (2011). Changing perspectives in Australian archaeology, part IX. Fishing for data—the value of fine-mesh screening for fish-bone recovery: a case study from Peel Island, Moreton Bay, Queensland. Technical Reports of the Australian Museum, Online 23, 133–151.

<sup>120</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>121</sup> Tibbetts IR, Hall NJ, Dennison WC (Eds.), 1998. Moreton Bay and Catchment. The University of Queensland, School of Marine Sciences, Brisbane.

<sup>122</sup> Thurstan R, Fraser K, Brewer D, Buckley S, Dinesen Z, Skewes T, Courtney T, Pollock B. (2019). Fishers and fisheries of Moreton Bay. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>123</sup> Gilby B, Olds A, Rissik D, Henderson C, Connolly R, Stevens T, Schlacher T. (2019). Performance of marine reserves for fish and associated ecological functions in the Moreton Bay Marine Park. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

Value	Fisheries
<i>State category (poor, fair, good, no data)</i>	<b>Good.</b> Based on data comparing to other regions in Queensland. This is older information that underpins the Ramsar Information Sheet (RIS) and Moreton Bay Study book. <sup>120,122</sup>
<i>Trend category (declining, stable, improving, no data)</i>	<b>No data.</b>
<i>Threats - Current Moreton Bay</i>	Lack of knowledge about status limiting management Low community 'care' or support for regulation Illegal fishing activities & non-compliance Disease Coastal erosion Fish habitat extent decline and fragmentation
<i>Threats - Future Moreton Bay</i>	Climate change Loss of fish habitat (land use change, development, coastal erosion) Disease
<i>Organisations acting on value or threats</i>	Queensland Government Department of Agriculture and Fisheries QYAC
<i>Impact of actions</i>	Unknown
<i>Gaps</i>	Data deficiency - lack of understanding of the status, trends and threats to fisheries "Sustainable Take of Fish" defined using data with high uncertainty Fisheries are not "wholistically" managed (i.e. focus is on extraction)
<i>Opportunities</i>	Research partnerships to understand status and threats to fisheries Targeted research to support wholistic management of fisheries Monitoring of recreational fishing Co-ordinate Bay stakeholders to plan and support wholistic management of resources (i.e. not just extraction focused for example) Develop an education and engagement campaign that showcases the Bay's values and unique ecosystems Strategic priorities for fisheries identified in QYAC's Strategy Plan 2022-2026 <sup>124</sup> , including: <ul style="list-style-type: none"> <li>• Advocate for a Quandamooka allocation of commercial fishing licenses and moorings, in addition to ensuring Indigenous Fishing Permits are accessible within sustainable limits and allow Quandamooka People to supply products to their own communities and surplus into the mainstream market.</li> <li>• Investigate the feasibility of an Aquaculture facility on Minjerribah.</li> </ul>

### A.3.5.2. Eco-tourism

Value	Eco-Tourism
<i>Description</i>	Eco-tourism is tourism that adopts sustainable tourism practices to reduce environmental impact. Visitors to Queensland are increasingly expecting sustainability (i.e. Eco-tourism) and accessibility embedded in business practices. Alongside this there is increasing demand for nature-based experiences more broadly.

<sup>124</sup> QYAC (2022). Strategic Plan 2022-2026. Available at [http://qyac.net.au/docs/QYAC\\_Strategic\\_Plan\\_2022-2026.pdf](http://qyac.net.au/docs/QYAC_Strategic_Plan_2022-2026.pdf)

Value	Eco-Tourism
	<p>Tourism is of growing importance to the Moreton Bay regional economy with increasing numbers of international and domestic visitors, as well as local day-trippers.<sup>125</sup> The Moreton Bay Region has well-developed infrastructure with a range of natural and built resources that have seen Moreton Bay form an important part of the Brisbane region's tourism product and market appeal. However, the increasing use of the Bay and the surrounding coastline by tourists and recreational users presents an environmental risk.</p> <p>Scenic amenity and nature-based experiences are a key driver of tourism in SEQ in general.<sup>125</sup> The region's tourism development plans have relied on the natural features of the Moreton Bay region, which includes the Marine Park and Bay islands (Minjerribah (Stradbroke), Moorgumpin (Moreton) and Yarun (Bribie) as a key differentiator from other capital cities. The greater Brisbane region currently receives 24 million visitors staying 51 million visitor nights, with 16 % exploring the region's rivers and 12% visiting the Bay.<sup>126</sup> Visitor numbers are growing faster than the national average, which represents an increasing threat, as well as an opportunity, to improve the management of the Bay's values. Through the stakeholder consultation process, local councils and Tourism and Events Queensland identified a lack of relationship and knowledge exchange between the organisations managing the Bay's ecological values and the tourism industry that relies on these values.</p> <p>Brisbane Marketing's 2031 Vision for the visitor economy outlines key goals for the region's tourism industry.<sup>127</sup> One goal of the 2031 Vision is to 'drive a positive contribution to our environment through restoration projects and environmental education'. The <i>Brisbane Tourism Investment Study</i>, completed in 2017, indicated that \$800 million of the \$6.5 billion growth potential for the region can be delivered through new nature-based experiences, including in Moreton Bay. This growth represents an opportunity to leverage tourism funding with the current understanding of Moreton Bay's values to maintain an effective sustainable tourism experience.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Fair.</b> Based on older information that underpins the Moreton Bay Study book and the Queensland Government Tourism Industry scorecard 2023. <sup>125,128</sup>
<i>Trend category (declining, stable, improving, no data)</i>	<b>Improving.</b> Based on older information that underpins the Moreton Bay Study book and the Queensland Government Tourism Industry scorecard 2023. <sup>125,129</sup>
<i>Threats -Current Moreton Bay</i>	<p>Increasing use</p> <p>As per threats to scenic amenity and recreational use, including water quality (pathogens, turbidity) and nuisance algal blooms</p> <p>Community perception that the Bay is in poor condition</p> <p>Low community connection and awareness</p> <p>Animals that bite and sting</p> <p>Perception of financial risk to tourist businesses due to permitting uncertainty (permits and renewals joint managed by QPWS and QYAC)</p>
<i>Threats - Future Moreton Bay</i>	<p>Climate change related migration of animals that bite and sting (jellyfish)</p> <p>Overuse</p>
<i>Organisations acting on value or threats</i>	<p>Queensland Government Department of Environment, Science and Innovation</p> <p>Tourism Queensland</p> <p>Queensland Government Department of Tourism and Sports</p>

<sup>125</sup> Ruhanen L, Orams M, Whitford M. (2019). Tourism in the Moreton Bay Region. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

<sup>126</sup> Brisbane Marketing (2019). Visitor Economy 2031: Vision for the Brisbane Region.

<sup>127</sup> Brisbane Marketing (2019). Visitor Economy 2031: Vision for the Brisbane Region. Available at: [https://teq.queensland.com/content/dam/teq/corporate/corporate-searchable-assets/industry/strategies/destination-strategies/2031\\_BNE\\_Visitor\\_Economy\\_Guide.pdf](https://teq.queensland.com/content/dam/teq/corporate/corporate-searchable-assets/industry/strategies/destination-strategies/2031_BNE_Visitor_Economy_Guide.pdf)

<sup>128</sup> Department of Tourism and Sports, Queensland (2023). Environmental Scorecard 2023 [WWW Document]. URL <https://www.dts.qld.gov.au/tourism/tourism-strategy/towards-tourism-2032/2023-queensland-tourism-industry-scorecard/environmental-scorecard> (accessed 4.25.24).

<sup>129</sup> Department of Tourism and Sports, Queensland (2023). Environmental Scorecard 2023 [WWW Document]. URL <https://www.dts.qld.gov.au/tourism/tourism-strategy/towards-tourism-2032/2023-queensland-tourism-industry-scorecard/environmental-scorecard> (accessed 4.25.24).

Value	Eco-Tourism
	<p>Queensland Parks &amp; Wildlife</p> <p>QYAC (Minjerribah Camping)</p> <p>QYAC (permitting)</p> <p>Local Council's tourism development agencies:</p> <ul style="list-style-type: none"> <li>• Brisbane Economic Development Agency</li> <li>• Moreton Bay Region Industry &amp; Tourism</li> <li>• Experience Gold Coast</li> <li>• Redlands Coasts Tourism</li> </ul>
<i>Impact of actions</i>	<p>Environmental impact unknown</p> <p>Eco-tourism certification is underway, but not yet an eco-certified tourist destination</p>
<i>Gaps</i>	<p>Brisbane Marketing's 2031 Vision calls for effective collaboration between the tourism industry and local councils; however, this collaboration needs to be expanded to include Bay managers for more effective management of high-use locations.</p> <p>Moreton Bay is not currently a certified eco-tourism destination, however it is a destination undergoing certification, and there are select eco-tourist certified operators in Moreton Bay (e.g. Minjerribah Camping) who are applying best-practice. Elevating the region to an eco-tourist destination status may be an opportunity for awareness raising about the value and uniqueness of Moreton Bay, while ensuring sustainable growth and delivery of the tourist economy.</p>
<i>Opportunities</i>	<p>Targeted research into impacts of high-use spots</p> <p>Establish partnerships between the tourism industry, chambers of commerce and other Bay management organisations to coordinate and advocate for the protection and enhancement of scenic amenity and nature-based experience in the Bay</p> <p>Advocate for Moreton Bay to become eco-certified tourist destination</p> <p>Develop an education and engagement campaign that showcases the Bay's values and unique ecosystems</p>

### A.3.5.3. Water Treatment Cycle

Value	Water Treatment Cycle
<i>Description</i>	<p>Moreton Bay and associated estuaries are the receiving environment for wastewater from the region's sewage network and treatment plants. As such, the nutrient processing and cycling function played by Moreton Bay and estuaries is a critical ecosystem service for the population of South East Queensland. The nutrient processing capacity of a system like Moreton Bay is affected by many factors, but includes: the amount of wetland habitat, such as mangrove and saltmarsh; the health and composition of the sediments and benthos; and also, water quality.<sup>130</sup> Historically wastewater inputs exceeded nutrient processing capacity, as evidenced by algal blooms and loss of seagrass in the western side of Moreton, reported in the late 90's and early 2000's.<sup>131</sup> Currently the capacity of Moreton Bay and its estuaries to process these anthropogenic nutrients appears to be stable, based on water quality data from the last two decades.<sup>132</sup> However, as the region's population increases, the nutrient inputs to the network are increasing, placing additional pressure on treatment infrastructure and the receiving environment.<sup>133</sup></p>
<i>State category (poor, fair, good, no data)</i>	<p><b>Fair.</b> This is based on current and historic water quality data from the Healthy Land and Water's monitoring program (EHMP), as reported in the Moreton Bay book 2019.<sup>132</sup></p>

<sup>130</sup> Dennison, WC., Abal, EG., (1999). The Moreton Bay Study. South East Queensland Regional Water Quality Management Strategy Team, Brisbane.

<sup>131</sup> Saeck, E.A., O'Brien, K.R., Weber, T.R., Burford, M.A., (2013). Changes to chronic nitrogen loading from sewage discharges modify standing stocks of coastal phytoplankton. *Mar Pollut Bull* 71, 159–167. <https://doi.org/https://doi.org/10.1016/j.marpolbul.2013.03.020>

<sup>132</sup> Saeck E, Udy J, Maxwell P, Grinham A, Moffatt D, Senthikumar S, Udy D, Weber T. (2019). Water quality in Moreton Bay and its major estuaries: Change over two decades (2000-2018). In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>133</sup> Healthy Land and Water (2024). Ecosystem Health Monitoring Program Website. Available at [www.hlw.org.au/portfolio/ecosystem-health-monitoring-program](http://www.hlw.org.au/portfolio/ecosystem-health-monitoring-program)

Value	Water Treatment Cycle
<i>Trend category (declining, stable, improving, no data)</i>	<b>Stable.</b> Based on trend assessment in the Moreton Bay book 2019 and latest EHMP water quality data 2023. <sup>132, 133</sup>
<i>Threats -Current Moreton Bay</i>	Population increase and increasing nutrient inputs Water quality catchment nutrient and sediment inputs Lack of knowledge about status and trends, limiting management Habitat removal & degradation, reducing the nutrient processing capacity Low political pressure from community Low community connection, awareness and stewardship
<i>Threats - Future Moreton Bay</i>	SEQ population growth Climate change Coastal and catchment development Catchment runoff - nutrients
<i>Organisations acting on value or threats</i>	Unity Water Urban Utilities Queensland Government Department of Environment, Science and Innovation Healthy Land and Water Council of Mayors (Resilient Rivers Initiative) Local councils and associated utilities
<i>Impact of actions</i>	Nutrient management prioritised and invested in Low to no decline over the past decade, despite large SEQ population increase (maintain stable)
<i>Gaps</i>	No values-based targets (thresholds unknowns) Limited co-ordination of nutrient management at larger scale
<i>Opportunities</i>	Wholistic strategic planning of habitat and nutrient management restoration projects Program of restoration/protection projects with industry and local government collaboration (to achieve co-benefit outcomes, but with a nutrient management focus) Targeted research to understand impacts of water quality objectives, stormwater quality objectives on the biodiversity values of the Bay Develop a whole of catchment prioritisation to identify suitable locations for point source management projects through the offset policy

## A.3.6. Access and recreation

### A.3.6.1. Recreational fishing, boating, snorkelling

Value	Recreational fishing, boating, snorkelling
<i>Description</i>	Moreton Bay is valued as a place for recreational activities on and under the water. <sup>134,135</sup> The close proximity to urban centres makes it a popular place to visit to do these activities. Healthy Land and

<sup>134</sup> Martin, V. (2023). Recreational Boaters' Use and Values of Moreton Bay 2022. Brisbane.

<sup>135</sup> Martin, V., Klein, C., Benham, C., Crowe, B. (2024). Mapping social values of Moreton Bay [WWW Document]. URL <https://storymaps.arcgis.com/stories/5ea4883393dc47a0a17e96d652e6a8ab> (accessed 4.25.24).

Value	Recreational fishing, boating, snorkelling
	<p>Water’s Annual Social Survey<sup>136,137</sup> estimates that 84% of local residents living on or beside Moreton Bay use it for recreational activities on a monthly basis and 53% on a daily basis. These activities represent economic, social and cultural benefits to the local community, including tourist visitation and improved health and wellbeing for residents.</p> <p>Recreation in and around the region’s waterways, including Moreton Bay, is estimated to be valued at billions of dollars per year.<sup>137</sup> Recreational fishing in Moreton Bay alone was valued at \$20 million in 2009, a value that is estimated to grow by \$1.3m–\$2.5m per year.<sup>138</sup> A study from 1982 estimated the value of recreational boating to be \$1.7m per year.<sup>139</sup> Estimates of the total expenditure by recreational fishers in Moreton Bay range from \$156m to \$194m per year.<sup>140</sup></p> <p>Current recreational fishery management is subject to regulations, including gear restrictions, size, and possession limits<sup>141</sup> to improve sustainability. However, unlike other states, a licence is not required to fish recreationally in Queensland. Increasing the area of no-take zones in the Moreton Bay Maring Park from 0.5% to 16% in 2009 has also sought to protect species and enhance their long-term sustainability.</p>
<i>State category (poor, fair, good, no data)</i>	<b>Good.</b> Based on Healthy Land and Water’s survey of local resident’s reporting their level of satisfaction with accessibility. Note this data is not specific to recreational boating activities only, and assesses all types recreational and social activities carried out on Moreton Bay and local waterways. <sup>137,142</sup>
<i>Trend category (declining, stable, improving, no data)</i>	<b>Declining.</b> No data, however anecdotal evidence indicates that it may be reaching capacity in some areas of the Marine Park. <sup>143</sup>
<i>Threats -Current Moreton Bay</i>	<p>Community perception that the Bay is in poor condition</p> <p>Lack of understanding of Bay values by users</p> <p>Illegal fishing activity &amp; non-compliance</p> <p>Conflict between commercial and recreational fishers</p> <p>Lack of data on recreational fishing limits understanding of impact or trends</p>
<i>Threats - Future Moreton Bay</i>	<p>Population growth</p> <p>Overcrowded anchorage sites</p> <p>Overfishing affecting fish community structure</p> <p>Sea level rise, reducing available habitat</p> <p>Coastal development, reducing available habitat and causing fragmentation</p> <p>Flood intensity &amp; frequency</p> <p>Low community awareness and stewardship</p>
<i>Organisations acting on value or threats</i>	<p>Queensland Tourism</p> <p>Queensland Parks &amp; Wildlife</p> <p>Healthy Land and Water monitoring</p> <p>Local Councils</p> <p>Maritime Safety Queensland</p>

<sup>136</sup> Dean, A. and Shultz, T., (2023). Community understanding and appreciation of Moreton Bay – a framework to support engaging communities. Report to the Moreton Bay Foundation.

<sup>137</sup> Tsoi, I., Castiglione, M., Guimaraes, D., Dean, A., Schultz, T., (2023). SocialNav: Social and Economic Waterway Benefits 2016-2023 data visualisation [WWW Document]. Healthy Land and Water. URL <https://app.powerbi.com/view?r=eyJrIjoia0Dk3Njg1ODctODMwMi00YmYxLTlmZDItYmYzNDk5NzQ4Mjg0IiwidCI6IjIyZVZlOTI0LWVjYtQtNDkNS1hZjdjLTg5MmFiNTM3Y2ZlZCJ9> (accessed 4.25.24).

<sup>138</sup> Pascoe, S, A. Doshi, Q. Dell, M. Tonks, R. Kenyon, (2014). Economic value of recreational fishing in Moreton Bay and the potential impact of the marine park rezoning. Tourism Management. 41:53-63.

<sup>139</sup> Secretariat of the Ramsar Convention (2023). Ramsar Information Sheet for Site No. 631, Moreton Bay, Australia, accessed 10 May 2024. Available at: <https://rsis.ramsar.org/> <https://rsis.ramsar.org/ris/631> or [www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf](http://www.dcceew.gov.au/sites/default/files/documents/41-ris.pdf)

<sup>140</sup> Pascoe, S, A. Doshi, Q. Dell, M. Tonks, R. Kenyon, (2014). Economic value of recreational fishing in Moreton Bay and the potential impact of the marine park rezoning. Tourism Management. 41:53-63.

<sup>141</sup> Queensland Government (2022) Recreational Fishing Rules. Available at: <https://www.qld.gov.au/recreation/activities/boating-fishing/rec-fishing/rules>

<sup>142</sup> Healthy Land and Water (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>143</sup> QPWS, pers comms, 2024

Value	Recreational fishing, boating, snorkelling
<i>Impact of actions</i>	Well regulated, except for numbers
<i>Gaps</i>	Lack of understanding of impact at popular anchorages Few programs to build knowledge of users
<i>Opportunities</i>	Awareness campaign Targeted research into impact of high use spots Develop an education and engagement campaign that showcases the Bay's values and unique ecosystems

### A.3.6.2. Swimming

Value	Swimming
<i>Description</i>	<p>Swimming holds significant value as a recreational activity in Moreton Bay. In locations with ocean beaches and pristine water, swimming is an integral part of the local lifestyle and tourism. For example on the eastern shores of Minjerribah (North Stradbroke Island) (e.g. Point Lookout) and Moorgumpin (Moreton Island) (including Tangalooma) and the Southport Spit. Inside the Bay, there are several swimming enclosures managed by the local councils, including City of Gold Coast, Redlands, Brisbane and Moreton Bay.</p> <p>Healthy Land and Water's social survey reports that, on average, local residents (living on or within 15 km of the Bay) use Moreton Bay and/or local waterways for swimming once a month (or approximately 12 times per year).<sup>144, 145</sup> These numbers are likely very conservative, as local day visitors to the Bay, who are residents of more inland areas (i.e. more than 15 km) are likely high based on bay tourism data<sup>146</sup></p> <p>Some swimming sites in the western, southern and Pumicestone passage areas of the Bay are at risk of microbial contamination, toxic algal blooms and/or things that bite or sting. Risk to human health can increase following heavy rainfall, as microbial contamination from urban sources enters the Bay through stormwater. Some Local Councils actively monitor and manage some sites to minimise risk to swimmers. Healthy Land and Water co-ordinate the Healthy Waterplay program, which provides some support for management of recreational waters in South East Queensland more broadly.<sup>147</sup></p>
<i>State category (poor, fair, good, no data)</i>	<p><b>Fair</b> in well-flushed eastern Moreton Bay areas with good water quality.</p> <p><b>Poor</b> in the western Moreton Bay areas, with poorer water quality and hazards.</p>
<i>Trend category (declining, stable, improving, no data)</i>	<p><b>Stable.</b> Limited whole-of-bay or long-term data. Based only on trends in monitoring data collected for EHMP/ Report Card using nutrients as a surrogate for catchment inputs.<sup>148,149</sup></p>
<i>Threats - Current Moreton Bay</i>	<p>Pollutants and water quality – turbidity and faecal material associated with runoff from urban and rural landscapes</p> <p>Community perception that bay is in poor condition</p> <p>Frequency of beach closures due to water quality health concerns</p>

<sup>144</sup> Tsoi, I., Castiglione, M., Guimaraes, D., Dean, A., Schultz, T., (2023). SocialNav: Social and Economic Waterway Benefits 2016-2023 data visualisation [WWW Document]. Healthy Land and Water. URL

<https://app.powerbi.com/view?r=eyJrjoiODk3Njg1ODctODMwMi00YmYxLTlmZDItYmYzNDk5NzQ4Mjg0liwidCI6IjIyZVZlOTI0LWVjYTQtNDIhNS1hZjdjLTg5MmFINTM3Y2ZlZCJ9> (accessed 4.25.24).

<sup>145</sup> Healthy Land and Water (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>146</sup> Ruhanen L, Orams M, Whitford M. (2019). Tourism in the Moreton Bay Region. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

<sup>147</sup> Healthy Land and Water (2024). Healthy Waterplay program webpage, available at: <https://www.hlw.org.au/portfolio/healthy-waterplay>

<sup>148</sup> Healthy Land and Water (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

<sup>149</sup> Saeck E, Udy J, Maxwell P, Grinham A, Moffatt D, Senthikumar S, Udy D, Weber T. (2019). Water quality in Moreton Bay and its major estuaries: Change over two decades (2000-2018). In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). Moreton Bay Quandamooka & Catchment: Past, present, and future. The Moreton Bay Foundation. Brisbane, Australia. Available at: <https://moretonbayfoundation.org/>

Value	Swimming
	Animals that bite and sting Algal blooms Low community connection, awareness and stewardship Lack of monitoring and understanding of trends
<i>Threats - Future Moreton Bay</i>	Flood intensity and frequency Climate change related increases in animals that bite and sting Coastal erosion
<i>Organisations acting on value or threats</i>	Local council Queensland Health Healthy Land and Water (Waterplay program)
<i>Impact of actions</i>	Monitoring and access management fair in some parts of the region
<i>Gaps</i>	No regional effort to improve conditions for swimming No knowledge of existing sites safe for swimming or that could be made safe
<i>Opportunities</i>	Targeted research into potential swimming sites Advocacy to return the western bay to a swimming destination

### A.3.6.3. Nature-based experiences

Value	Nature-based experiences
<i>Description</i>	Residents and tourists value the Bay for the opportunity it presents to see and experience nature. The scenic-amenity and opportunity for nature-based experiences are cited as key reasons that the community value and recreate in Moreton Bay. <sup>150,151,152,153</sup> Nature-based experiences offer an escape from the pressure of modern life by allowing an individual to immerse themselves in the sights and sounds of nature. Many studies suggest that green and blue space experiences provide multiple physical and mental health benefits for an individual and community. Example activities include recreation (walking, boating, swimming, snorkelling), bird watching, photography, beachcombing or tide pooling.  Approximately 83% of community respondents to a social survey identified nature-based experiences as a key reason to visit the Bay, with 71% citing aesthetic physical appeal and beauty as key values. <sup>154</sup> Healthy Land and Water's social survey reports that, on average, local residents (living on or within 15 km of the Bay) use Moreton Bay and/or associated local waterways 250 days of the year for recreation—most of which is walking/running or enjoying-nature. <sup>150,155</sup>
<i>State category (poor, fair, good, no data)</i>	<b>Good.</b> Limited data. Based on Healthy Land and Water's social monitoring of waterway benefits <sup>150</sup> and research of Moreton Bay recreational boater values. <sup>153</sup>
<i>Trend category (declining, stable)</i>	<b>No data</b>

<sup>150</sup> Tsoi, I., Castiglione, M., Guimaraes, D., Dean, A., Schultz, T., (2023). SocialNav: Social and Economic Waterway Benefits 2016-2023 data visualisation [WWW Document]. Healthy Land and Water. URL

<https://app.powerbi.com/view?r=eyJrjoiODk3Njg1ODctODMwMi00YmYxLTlmZDItYmYzNDk5NzQ4Mjg0liwidCI6IjIyZVZlOTIOLWVjYUQtNDkNS1hZjdjLTg5MmFiNTM3Y2ZlZCJ9> (accessed 4.25.24).

<sup>151</sup> Jones NA, Ross H, Shaw S, Witt K, Pinner B, Rissik D. (2016) Values towards waterways in south east Queensland: Why people care. *Marine Policy*. 71:121–31

<sup>152</sup> Martin, V. (2023). *Recreational Boaters' Use and Values of Moreton Bay 2022*. Research report for The Moreton Bay Foundation.

<sup>153</sup> Martin, V., Klein, C., Benham, C., Crowe, B. (2024). Mapping social values of Moreton Bay [WWW Document]. URL <https://storymaps.arcgis.com/stories/5ea4883393dc47a0a17e96d652e6a8ab> (accessed 4.25.24).

<sup>154</sup> Ross H, Jones N, Witt K, Pinner B, Shaw S, Rissik D, Udy J. (2019). Values towards Moreton Bay and catchments. In Tibbetts, I.R., Rothlisberg, P.C., Neil, D.T., Homburg, T.A., Brewer, D.T., & Arthington, A.H. (Editors). *Moreton Bay Quandamooka & Catchment: Past, present, and future*. The Moreton Bay Foundation. Brisbane, Australia. Available from: <https://moretonbayfoundation.org/>

<sup>155</sup> Healthy Land and Water (2024). Report Card [WWW Document]. URL <https://reportcard.hlw.org.au/> (accessed 1.9.24).

Value	Nature-based experiences
<i>improving, no data)</i>	
<i>Threats - Current Moreton Bay</i>	<ul style="list-style-type: none"> <li>Few opportunities</li> <li>Community perception that the Bay is in poor condition</li> <li>Lack of understanding of Bays values, particularly underwater values</li> <li>Pollutants and water quality</li> <li>Lack of monitoring and understanding of trends</li> </ul>
<i>Threats - Future Moreton Bay</i>	<ul style="list-style-type: none"> <li>Sea level rise, reducing available habitat</li> <li>Flood intensity and frequency</li> <li>Decline in habitat extent and condition</li> </ul>
<i>Organisations acting on value or threats</i>	<ul style="list-style-type: none"> <li>Queensland Government Department of Environment, Science and Innovation</li> <li>Tourism Queensland</li> <li>Queensland Government Department of Tourism and Sports</li> <li>Queensland Government Queensland Parks and Wildlife Service</li> <li>QYAC (Minjerrabah Camping)</li> </ul>
<i>Impact of actions</i>	A few key places for nature-based experiences but not many for the wider community
<i>Gaps</i>	<ul style="list-style-type: none"> <li>Not well co-ordinated at a bay-wide scale</li> <li>Few programs to build knowledge</li> <li>More needs to be done to understand what aspects of scenic amenity and nature-based experiences are important to improve or preserve for people</li> </ul>
<i>Opportunities</i>	<ul style="list-style-type: none"> <li>Awareness campaign</li> <li>Targeted research into economic and social opportunities for nature-based experiences</li> </ul>

## A.4. Summary

Note – this summary section is replicated from the Blueprint report.

### A.4.1. Values considered in existing plans and strategies

The plans and strategies reviewed considered a broad range of environmental, social and economic values, as summarised in Table A6. The most common value theme was *natural and unique ecosystems*, with the majority of plans highlighting this as a key value, particularly noting the need to protect and maintain biodiversity more generally. This is unsurprising as there is policy and regulation at a national and state level that requires the protection of species, vegetation communities and wetlands of conservation significance. The Bay is home to many natural assets triggered by regulation therefore these values must be considered in planning at a local and regional scale.

Other very common values were *natural beauty*, *traditional owner cultural values* and *recreational access* especially for boating and fishing. Like biodiversity, Traditional Owner cultural value (and scenic amenity to a lesser extent) are the focus of policy and regulation at a national and state level, therefore must be considered in planning. However, natural beauty and recreational access were cited as values raised via community consultation.<sup>156</sup>

<sup>156</sup> For example see: Moreton Bay Regional Council. (2023). *Moreton Bay's Living Coast Plan 2023*. Available at: [https://hdp-au-prod-app-mbay-yoursay-files.s3.ap-southeast-2.amazonaws.com/4316/8541/0078/Moreton\\_Bay\\_s\\_Living\\_Coast\\_Plan\\_Final.pdf](https://hdp-au-prod-app-mbay-yoursay-files.s3.ap-southeast-2.amazonaws.com/4316/8541/0078/Moreton_Bay_s_Living_Coast_Plan_Final.pdf)

The values under the theme of *sustainable use of ecosystems* were the least mentioned, but still considered by a third of the plans and strategies reviewed, likely reflecting the type of strategies and plans reviewed. It may be that sustainable use is considered in regulation and planning developed at a state and national level that were not reviewed in this assessment. However, it does reflect a gap or lower level of management focus at a local and Moreton Bay specific scale.

Table A6. Plans and strategies reviewed to generate an integrated list of values for the Bay (1 = plan/strategy identified value as important to stakeholders/community)

Value theme	Values	International		Regional				City of Moreton Bay			Redland City Council		City of Gold Coast		Brisbane City Council	QYAC		% of documents with value mentioned
		UN Sustainability Goals	Ramsar Convention (Ramsar Information Sheet)	Shaping SEQ 2023	SEQ NRM Plan	Resilient Rivers Initiative Strategy	TIMBF Strategic Plan	Living Coast Plan 2023	Total Water Cycle Management Plan	Environment & Sustainability Plan 2042	Redlands Coast Bay and Creeks Plan 2021–2031	Coastal Hazard Adaptation Strategy	Gold Coast Plan 2022-2027; Out City Vision Gold Coast 2032	Coastal adaptation plan	Brisbane Vision 2031	QYAC Strategic Plan 2022-2026	QYAC Research Priorities (version 2).	
Resilience natural & unique ecosystem	Marine turtles		●				●	●			●							
	Shorebirds		●	●			●	●			●	●						
	Marine mammals		●				●	●			●	●						
	IUCN listed species		●								●					●	●	
	Fish communities		●	●			●											
	Open coastline (headlands, beaches, dunes)					●						●	●	●				
	Mangroves		●			●		●			●	●		●				
	Saltmarsh		●			●		●			●	●		●				
	Seagrass		●			●		●	●		●	●						
	Mudflats		●									●						
	Coral reefs		●					●										
	Shellfish reefs		●					●										
	Groundwater dependent ecosystems												●					●
	Biodiversity (as a general mention)		●	●	●		●				●			●				●
Other/general mention (e.g. natural ecosystem value)												●	●	●		●		
<b>SUMMARY</b>		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	88%
Coastal living	Natural beauty (including scenic amenity, water quality)			●		●				●	●	●	●	●	●			
	Coastal community protection (flooding, storm tide, erosion, sea level rise)	●						●				●	●	●				
	Other/general mention																	
	<b>SUMMARY</b>	●		●		●		●		●	●	●	●	●	●			63%
Traditional Owner cultural values	Quandamooka Cultural knowledge																●	
	Historic cultural heritage																●	
	Traditional hunting resources																●	
	Access to undertake cultural & spiritual activities																●	
	Other/general mention					●	●	●		●	●					●	●	
<b>SUMMARY</b>					●	●	●	●	●	●					●	●	44%	
	Community connection	●					●				●			●			●	

Community connection & stewardship	Community stewardship	●		●		●		●	●	●		
	Wellbeing & identity		●	●		●	●			●		
	Exploration, discovery for young people			●								
	Other/general mention											
	<b>SUMMARY</b>	●	●	●	●	●	●		●	●	●	56%
Sustainable use of ecosystems	Fisheries	●		●								
	Eco-tourism						●			●	●	
	Water treatment cycle								●		●	
	Other/general mention										●	
	<b>SUMMARY</b>	●		●		●	●	●	●	●	●	38%
Access & recreation	Recreational fishing, boating, snorkelling		●	●	●		●		●			
	Swimming		●	●	●							
	Nature-based experiences			●						●		
	Other/general mention (e.g. recreational access; access & use infrastructure)				●		●	●	●	●	●	
	<b>SUMMARY</b>		●	●	●		●	●	●	●	●	56%

## A.4.2. Condition and trend of Moreton Bay's values

A summary of the assessment of the condition of each of the 25 values, and their associated threats, is summarised in Table A7.

Nine of the 25 values assessed were defined as being in good condition, including *fish communities, mangroves, mudflats, coastal community protection, fisheries, and recreational access*. The review indicated that condition of these values may be disturbed and slightly modified, however they are still considered to resemble remnant ecosystems in structure and deliver many of the same ecological/social functions. Concerningly, for approximately half (4) of the good condition values, the assessment found their condition to be declining or unknown. Specifically, these currently good condition values were *shorebirds* (declining), *coastal community protection* (declining), *fisheries* (unknown) and *recreational fishing, boating* (declining).

In contrast, nine of the values were considered to be in poor or fair condition. The values in poor condition, included *saltmarsh, shellfish reefs* and *exploration/discovery for young people*. The values in fair condition, included *seagrass, coral reefs, natural beauty, community connection, water treatment cycle and swimming*. The review indicated that the condition of these values has been significantly disturbed and modified, resulting in an ecosystem service that minimally resembles, or does not resemble, pre-disturbance structure and function. Of highest concern, was the poor condition values, were either declining (*saltmarsh*) or stable (*shellfish reef*) with no indication of recent improvement.

Approximately six of the values had no available data and information to assess either condition or trend. Many of which were *natural and unique ecosystem* values (herein referred to as biodiversity values), including *marine turtles, marine mammal, IUCN threatened species and open coastlines*, but also some social values that are challenging to measure including *natural beauty, well-being/identity and community stewardship*.

## A.4.3. Threats to Moreton Bay's values

Our threat analysis indicates that there are many pressures which collectively represent significant current and future risk to all the Bay values. A summary of current and future threats to each of the values is presented in Table A7 next to their respective condition assessments.

The current threats to the biodiversity values were identified as predominantly ecosystem modification type threats, with the majority of values threaten by *declining habitat extent, habitat fragmentation and weeds, pests and diseases*. Noting that these same values are also under pressure from *population growth* related threats, which are further exacerbated by the *lack of community awareness* of their presence and lack of stewardship behaviours to promote their protection. Looking to the future, climate threats are predicted to place more pressure on the condition and function of biodiversity values as the Bay experiences *sea level rise, temperature increases and increases in extreme events*. For the light dependent and nutrient sensitive ecosystem values—*seagrass and coral reefs*—catchment sediment and nutrient pollutants were also flagged as a significant threat. For many of the fauna species, *microplastics* was identified as an additional threat to condition.

The analysis identified that social type values (e.g. values in themes *community connection & stewardship, wellbeing, access & recreation values*) are largely under threat from pollutants that impact aesthetics (*litter*) and swimability (*nutrients, sediments, water quality*), but also lack of *community awareness* or knowledge of the Bay values. These values also face significant pressure from future population growth related threats, including *coastal development and overuse*.

Coastal community protection value (i.e. the capacity for the Bay ecosystems to buffer communities from flooding, storm tide, erosion, sea level rise), is currently in good condition, however it is under the looming threat of climate change, notably sea level rise and increased extreme events. Additional threat comes from the community's lack of awareness about the ecosystem services provided by the Bay and therefore low levels of community stewardship or support for government implement natural solutions to minimise the predicted climate threat.

Traditional Owner cultural values are threatened by similar processes that reduce the condition and availability of the natural values and resources of the Bay (including extraction, overfishing, coastal erosion, pests and weeds, habitat loss, coastal development). These threats increase as the SEQ population rapidly grows. The level of awareness in the broader

SEQ community of the significant cultural value of the Bay may have an impact on the levels of protection given to protecting these values.

**Table A7. Quantitative assessment of the Bay values and identification of threats to values (refer to Table 4 for description of condition and trend categories) CONDITION & TREND KEY: U = unknown, G = good, F = fair, P = poor; D = declining, S = stable; THREATS KEY: I = increasing; ● = current threat, ○ = future threat, ⊙ = both current & future threat; E=ecology/behaviour unknown, M=monitoring absent/minimal, T= future trends uncertain; MANAGEMENT KEY: | = <20%, || = 20-40%, ||| = >40%; N=none; M=mention, P= protection explicitly in legislation**

VALUES ASSESSMENT				THREATS															MANAGEMENT					
Value theme	Value	Condition	Trend	POLLUTANTS				ECOSYSTEM MODIFICATION				CLIMATE			POP. GROWTH			STEWARDSHIP			R&D			
				Catchment runoff – nutrient, toxicants	Catchment runoff - sediments	Current Water quality	Litter / microplastics	Coastal erosion	Weeds / pests / disease / algal blooms	Habitat area width / extent decline	Fragmentation/ habitat connectivity	Sea level rise	Temperature increases	Rainfall/extreme events / flooding	Coastal development / artificial coastlines	Human & dom. animal disturb / overuse	Harvesting / overfishing / extraction	Low community connection	Low community awareness	Low community stewardship	Lack of data/knowledge	Prioritised in other strategies/plans	Confirmed by stakeholders as priority	Protected explicitly in legislation
Resilience natural & unique ecosystem	Marine turtles	U	U			●	●	●	●			○	○	⊙	⊙	⊙					T			P
	Shorebirds	F to G	D			●	○		⊙	●		○		○	⊙	⊙	●	●	●				P	
	Marine mammals	U	U			●		●	⊙					⊙	⊙			●		EMT			P	
	IUCN listed species	U	U			●	⊙		⊙	⊙	○	○	⊙	⊙	⊙		●	●		EMT			P	
	Fish communities	G	S			●	●		●	○	●	○	○	⊙	●		⊙			ET			P	
	Open coastline (headlands, beaches, dunes)	U	D				●	●	●	●		○			●	●		●	●	EMT			M	
	Mangroves	G	I				●	●		●		○		○	⊙	⊙	●	●	●	T			P	
	Saltmarsh	P	D				●	●	●	●		○	○	○	⊙	●	●	●	●	T			P	
	Seagrass	F	variable		●	●	●		●	●	●	●	○	○	○					T			P	
	Mudflats	G	S				○		●														N	
Coastal living	Coral reefs	F	S to I		●	●	●		●	●	●	○	○	○			●		●	MT			M	
	Shellfish reefs	P	S			●		⊙	●	●	○	○	○	●	●	●	●	●	●	MT			N	
	Natural beauty (including scenic)	F	U		●	●	●	●	●		○		○	●			●			EMT			P	

	amenity, water quality)											
	Coastal community protection (flooding, storm tide, erosion, sea level rise)	G	D		● ●	○ ⊙ ⊙		⊙ ⊙				N
Traditional Owner cultural values	Cultural heritage, Quandamooka cultural knowledge, traditional hunting resources, access to undertake cultural & spiritual activities <sup>157</sup>	Not rated	Not rated		⊙ ● ●	○ ⊙ ⊙		● ● ●	T			P
Community connection & stewardship	Community connection	F	S	● ● ● ●	⊙ ⊙ ○		○ ○ ○	● ● ●				N
	Community stewardship	U	S	● ● ● ●			○ ○ ○	● ● ●				N
	Wellbeing & identity	U	U	● ● ● ●			○ ○ ○	● ●				N
	Exploration, discovery for young people	P	S	● ● ● ●		○	○ ○	● ● ●				N
Sustainable use of ecosystems	Fisheries	G	U		⊙ ⊙ ● ●			●	● ● ●	T		P
	Eco-tourism	F	I	● ● ● ●	● ○	○ ⊙	●	● ●				N
	Water treatment cycle	F	S	⊙ ●		●	○ ○ ○	○	● ● ●	T		P
Access & recreation	Recreational fishing, boating, snorkelling	G	D			○ ○	○ ○	○ ○	⊙ ⊙	EMT		N
	Swimming	variable	S	● ● ● ●	○ ●		○ ⊙	○ ○	● ● ●	MT		N
	Nature-based experiences	G	U	● ● ● ●		○ ○	○ ○		● ●	EMT		N

<sup>157</sup> As reported in: Quandamooka Yoolooburrabee Aboriginal Corporation. (2022). *QYAC Strategic Plan 2022-2026*. Available at: [http://www.qyac.net.au/docs/QYAC\\_Strategic\\_Plan\\_2022-2026.pdf](http://www.qyac.net.au/docs/QYAC_Strategic_Plan_2022-2026.pdf)

## A.4.4. Gaps and barriers to a sustainable Bay

### A.4.4.1. Knowledge gaps about values and threats

There are several values for which our understanding is backed by significant body of research and monitoring, including *shorebirds, mangroves, seagrass, water treatment cycle* and *fisheries*. Despite this there are many key values for which there is either no, or very limited, data and information available to characterise current condition or trend. In terms of predicting future trajectories, the available data and information is even sparser. Notably for 17 of the 25 values, there is no, or insufficient, information currently available to understand the future trajectory of condition. The uncertainty in future trends is concerning and limits effective management, especially for biodiversity values that are in poor, declining, or unknown condition, such as *marine mammals, IUCN species, marine turtles, saltmarsh, shellfish reefs, open coastlines*, and *natural beauty*.

There were a few values assessed for which their current condition and trend also represents a threat to the other values. Specifically *access and recreation*, where overuse was identified as a threat, and also *community connection* for which low levels of connection was identified as a threat. Limited data and information available for these values limits capacity to understand and manage the future threats they may pose.

### A.4.4.2. Gaps in the management of values

The majority of biodiversity values (8 of 12) were found to be explicitly protected under national and state legislation, with the exception of mudflats, coral reefs, shellfish reefs and open coastline. *Traditional Owner cultural values, fisheries* and *water treatment services* were also found to be explicitly protected. The majority of remaining values (11 of the 25), which are predominantly social and economic values, were not mentioned and only managed via non-statutory strategies and plan. Many of these were only prioritized in a few (less than 10 %) plans. The values with the lowest levels of protection/prioritisation in legislation, plans and strategies were: *mudflats, shellfish reefs, exploration/discovery by young people, swimming* and *nature-based experiences*.

The background features a series of overlapping, organic shapes in various shades of green and teal. A light green shape is at the top, followed by a white shape, then a medium green shape, and finally a dark teal shape at the bottom. The shapes overlap to create a layered, landscape-like effect.

# Appendix **B**

## Social Barriers Analysis

## B.1. Purpose of Appendix B

This document is an appendix to the *Blueprint for a sustainable Moreton Bay for people and nature (2025-2035)*, prepared by Mosaic Insights on behalf of The Moreton Bay Foundation. The purpose is to provide additional details of tasks undertaken to inform development of the Blueprint.

Specifically, this *social barriers analysis* task summarised social barriers to implementing actions that improve the health of Moreton Bay and then contrasted this with a short literature review of known barriers to marine stewardship actions. Barriers had been previously identified through stakeholder engagement activities, including interviews, workshop and questionnaire, as described in Appendix A.

## B.2. Understanding marine stewardship for the Bay

In our efforts to improve the health of Moreton Bay in South East Queensland, it is crucial to acknowledge the complex interplay of social factors that influences marine stewardship. Stewardship can mean a wide range of direct and indirect actions that lead to positive environmental health and social outcomes. In the context of Moreton Bay, these stewardship actions could include:

- **Lifestyle actions:** e.g. reducing the use of household and garden chemicals
- **On-ground actions:** revegetating riparian areas, removing litter from beaches, or avoiding anchoring in seagrass beds
- **Civic actions:** (including advocacy such as) signing a petition asking for stronger restrictions on coastal development, or attending a public meeting
- **Social actions:** encouraging others to care for marine life or follow rules.<sup>158</sup>

Our understanding of social barriers (in particular, community-level social barriers) to environmental actions for Moreton Bay is based on social research in South East Queensland, which was undertaken for The Moreton Bay Foundation by Dean and Schultz<sup>159</sup>. This report explains relevant theories and previous research in more detail. Their report summarises findings from a representative survey of 3,208 South East Queensland residents. The analysis identified five distinct segments of the population based on their understanding and appreciation of Moreton Bay. The groups included:

- **Champions:** this group represent one quarter of the sample (24%) and exhibit high scores for all items, i.e., knowledge, familiarity with wildlife, appreciation – wildlife, appreciation general and willingness to share information.
- **Appreciative but not aware:** this group reflects more than one quarter of the sample (28%), and scores highly on appreciation of wildlife and willingness to share information. Knowledge scores were the lowest of all groups, and familiarity with wildlife scores were below average.
- **Receptive but unfamiliar:** this group (11% of sample) was characterised by strong knowledge and positive appreciation, but exhibited the lowest familiarity with wildlife species in Moreton Bay. Willingness to share information was positive, but lower than the other engaged groups.
- **Aware but not receptive:** participants in this group (14% of sample) exhibited high objective knowledge and average familiarity with wildlife. However, both wildlife and general appreciation, and willingness to share information was low.

---

<sup>158</sup> P.26 of Dean, A. and Shultz, T., (2023). Community understanding and appreciation of Moreton Bay – a framework to support engaging communities. Report to the Moreton Bay Foundation.

<sup>159</sup> Dean, A. and Shultz, T., (2023). Community understanding and appreciation of Moreton Bay – a framework to support engaging communities. Report to the Moreton Bay Foundation.

- **Disengaged:** participants in this group were below average for all dimensions, including knowledge, familiarity with wildlife appreciation (wildlife and general) and willingness to share information.<sup>160</sup>

Understanding differences between these groups will help to shape different strategies, especially relevant communication campaigns, to encourage each group to take specific actions for Moreton Bay. Notable findings from the study include:

- In the previous 12 months, 32% never visited Moreton Bay, and 27% only once or twice
- Beauty, environment and nature, wildlife, relaxation and peaceful are salient features of people’s thoughts of Moreton Bay
- 30% identified a part of the Bay that is special to them
- In terms of values and benefits of Moreton Bay, 26% said Moreton Bay does not provide any benefits to them. This is interesting given more than that (one third) reported having never visited the Bay, and that another quarter of the sample only visited once or twice in the previous year. This suggests that people value the Bay even if they have little experience with it.
- Most of the respondents agreed that Moreton Bay is important for:
  - providing jobs and income for South East Queenslanders
  - being a popular recreation and tourism destination
  - the unspoiled natural places that exist in the Bay
- Most agreed that the Bay should be kept healthy for future generations.








## B.3. Common social barriers to environmental actions

This section presents a typology of common social barriers that *may* hinder whether someone does or does not adopt a particular marine stewardship action (Table B1). It is important to understand that the presence and impact of these barriers are not uniform across all actions nor target audience. It is likely that all of the barriers described in the below typology play some role, however, the **extent** to which a particular barrier affects an individual's or group's ability to contribute positively to the health of Moreton Bay will vary greatly, and other unidentified barriers may be at play. This variation is driven by several factors, including the nature of the proposed action, the specific characteristics of the target audience, as well as the broader socio-cultural and economic context. This variability underscores the need for tailored strategies that considers both the specific stewardship action being targeted **combined** with the unique motivations, capacities, and opportunities of different community segments. As we explore these social barriers, it is important to understand the identification of the barriers is just one step toward developing more inclusive and effective approaches to protecting Moreton Bay.

---

<sup>160</sup> P.2 of Dean, A. and Shultz, T., (2023). Community understanding and appreciation of Moreton Bay – a framework to support engaging communities. Report to the Moreton Bay Foundation.

**Table B1 Summary of social barriers to environmental action**

Personal barriers (intrapersonal) <i>Psychological barriers internal to the individual</i>	Personal barriers (interpersonal) <i>Barriers related to the individual's social networks</i>	External barriers (external direct) <i>Barriers related to the action itself</i>	External barriers (external indirect) <i>Barriers external to the action and the individual</i>
 <p>Lack of Awareness/ Appreciation<sup>161</sup>: Often, individuals and communities are not fully aware of the ecological importance of Moreton Bay or the specific threats it faces. This gap in knowledge can lead to apathy or inaction, as people may not recognise the impact of their behaviours on the Bay's health or understand the benefits of conservation efforts.</p>	 <p>Lack of social network opportunities: Social network constraints such as availability of other people to do the action with, or the opportunity of being invited to do the action with others can lead to inaction.</p>	 <p>Knowledge and Learning Complexity: Actions that are complex or difficult to understand can deter engagement. Conservation actions that require specific technical skills or resources not readily available to the target audience can present significant barriers.</p>	 <p>Institutional and Regulatory Obstacles: Complex regulatory environments, lack of supportive policies, or bureaucratic inertia can stifle initiatives aimed at improving the Bay's health. These barriers can make it challenging for community groups and individuals to navigate legal requirements or access funding and other resources necessary for action.</p>
 <p>Lack procedural knowledge – Procedural knowledge involves understanding the specific actions and steps that can be taken to contribute to the conservation of Moreton Bay. This encompasses knowledge about what practical measures individuals and organizations can implement but also <i>how</i> to implement them.</p>	 <p>Social norms and fear of social disapproval: Perceived social norms such as <i>injunctive norms</i> and <i>descriptive norms</i> can influence whether a person undertakes a particular action, or not. Injunctive norms are our <i>perceived</i> expectations that others have of our own behaviour, whereas descriptive norms are what we perceive others to be actually doing. Injunctive norms can lead to feelings of embarrassment or potential criticism if the behaviour violates social expectations (e.g., environmental activism is seen by some people as an undesirable behaviour, which discourages specific environmental actions). On the other hand, when a behaviour is commonly observed (especially by influential people) are seen to be undertaking a particular</p>	 <p>Resource and Equipment Complexity: This barrier refers to conservation actions that require specialized equipment, or access to certain materials that are not readily available to the target audience.</p>	

<sup>161</sup> Knowledge and awareness gaps are often identified as barriers to marine stewardship, but research suggests they may not be the most significant obstacles. Studies indicate that even when individuals are informed about issues, this does not necessarily translate into action, a phenomenon known as the [knowledge-behaviour gap](#). This gap highlights that while raising awareness is important, it alone [is insufficient to spur behavioural change](#). Effective stewardship thus requires addressing deeper motivational and structural barriers that prevent informed individuals from taking action. Consequently, while educational and awareness raising initiatives are valuable, they should be part of a broader strategy that also tackles other more impactful barriers.

Personal barriers (intrapersonal) <i>Psychological barriers internal to the individual</i>	Personal barriers (interpersonal) <i>Barriers related to the individual's social networks</i>	External barriers (external direct) <i>Barriers related to the action itself</i>	External barriers (external indirect) <i>Barriers external to the action and the individual</i>
---	--	---	--

action, this can empower social change.



Negative emotions can significantly impede the adoption of behaviours aimed at conserving natural environments like Moreton Bay. Feelings of fear, frustration, and helplessness, in particular, can overwhelm individuals, leading them to disengage from conservation efforts or reject changes necessary for environmental protection. These emotions often arise from the perceived enormity of environmental challenges, a sense of inadequacy in effecting change, or frustration with the complexities and pace of implementing solutions, thus acting as formidable barriers to proactive environmental action.



Cultural Norms: Prevailing cultural attitudes can inhibit environmental action. Practices that are harmful to the Bay might be deeply embedded in the local lifestyle or economy, making change difficult.



Time Requirements: Actions that require a significant time investment can be a barrier, especially for individuals with limited free time or organizations operating under tight schedules. The perceived or actual time needed to implement and maintain a conservation action can deter participation.



Value/Use conflicts: In many cases, there may be a perceived or real conflict between conservation efforts and other interests, such as development, industry, or recreational activities. Stakeholders may resist environmental initiatives if they believe these efforts threaten their livelihood, property values, or access to resources.



Risk Aversion: Some people and/or groups are naturally risk averse and this can lead to a reluctance to support or engage with these actions. This cautious attitude is often exacerbated by a lack of clear, immediate benefits or past experiences where similar efforts have failed, leading to a preference for maintaining the status quo rather than risking change.



Perceived high risk/potential for negative outcomes: Actions perceived as high risk or where concern for negative outcomes are high, can deter adoption. This apprehension often stems from concerns over potential economic losses or failure to achieve intended conservation goals.



Individual Financial Situation: People may be highly motivated to contribute to the health of Moreton Bay but find themselves financially unable to prioritize environmental actions over immediate needs such as housing, food, and healthcare. The disposable income available for individuals greatly influences their ability to support or participate in conservation efforts, regardless of their environmental consciousness.



Perceived Self, Response and Collective Efficacy: A sense of powerlessness or scepticism about the effectiveness of individual or collective actions can demotivate people. This barrier is often rooted in the belief that environmental issues are too vast for local



Access and physical barriers represent a significant social barrier to the adoption of conservation actions aimed at protecting Moreton Bay, encompassing both the lack of opportunities to engage in sustainable practices and the fear of losing access to

Personal barriers (intrapersonal) <i>Psychological barriers internal to the individual</i>	Personal barriers (interpersonal) <i>Barriers related to the individual's social networks</i>	External barriers (external direct) <i>Barriers related to the action itself</i>	External barriers (external indirect) <i>Barriers external to the action and the individual</i>
actions to make a difference, leading to resignation rather than engagement.		valuable resources and activities (for example, fishing and recreation). Individuals and communities may face challenges in accessing the means or locations necessary to participate in conservation-oriented behaviours, such as habitat restoration sites or sustainable fishing areas, due to geographic, logistic, or regulatory constraints.	



**Misinformation and Mistrust:** Misinformation about environmental issues or distrust towards scientific communities, government bodies, or non-profit organizations can impede progress. Scepticism about the motives or effectiveness of proposed actions can lead to resistance against even well-intentioned initiatives.



**Cost of Adoption:** There are direct and indirect expenses associated with implementing specific conservation actions. Barriers can include the financial investment required to initiate and sustain such practices, including upfront costs, maintenance expenses, and potential loss of income or increased operational costs for businesses adapting to environmentally friendly practices. Even when individuals or organizations recognize the long-term benefits of these actions for Moreton Bay, the immediate financial implications can serve as a significant deterrent, particularly if incentives or subsidies to offset these costs are insufficient or non-existent. This is particularly true when any economic benefits (which are often indirect) are not immediately apparent or tangible.

## B.4. Social barriers to actions in the Blueprint – next steps

Across the programs identified in the Blueprint, there are approximately 30 priority actions. Targeted strategies will need to be developed for each specific action in more detail, once the actual barriers to each specific action are identified. To assist this process, we have identified potential target audiences, some possible barriers, and potential solutions for relevant social barriers to specific **community-related advocacy and awareness** actions in the Blueprint programs. This list covers only those actions that include social behaviour change, as opposed to changes to legislation, funding sources,

research, etc. The list of potential barriers is not exhaustive, nor will it be accurate in the identification of *actual* barriers and solutions for each specific action. It is intended to be a starting point for further thought, discussion, and planning. It is important to note that there is no silver bullet. The influence of social barriers, and the extent or strength of that influence, will vary depending on the target audience, the action being targeted and the broader socio-cultural context. Behaviour change strategies typically require a multi-pronged approach to support greater adoption of environmental actions, and this is anticipated to also be the case for the Moreton Bay actions documented by the Blueprint.

It is *essential* that for all behaviour change strategies developed under this Blueprint, that the appropriate formative and target audience research is conducted first. Doing this will identify the relevant factors that currently hinder each specific action. While this advice applies mostly to the individuals and stakeholder groups in the Bay, and the actions they may take, a different approach may be needed for broader, systemic changes to actions such as policy and research support for the benefit of Moreton Bay. It will be valuable to bring together various groups impacted by or interested in the prioritised actions—including local communities, industry representatives, policymakers, and environmental groups—to discuss these barriers and collaborate on potential solutions. This dialogue will help develop mutual understanding and tailor interventions that are culturally appropriate, economically viable, and environmentally effective.

The background features a series of overlapping, wavy, organic shapes in various shades of green and teal. A light green shape is at the top, followed by a light greyish-green shape, and a dark teal shape at the bottom. The shapes overlap to create a layered, modern aesthetic.

# Appendix **C**

## Regulatory Barriers Analysis

## C.1. Purpose of Appendix C

This document is an appendix to the *Blueprint for a sustainable Moreton Bay for people and nature (2025-2035)*, prepared by Natural Capital Economics and EcoFutures on behalf of The Moreton Bay Foundation. The purpose is to provide additional details of tasks undertaken to inform development of the Blueprint.

Specifically, this task reviewed existing plans and regulatory frameworks for Moreton Bay management, and provides a

- Summary of key regulations relevant to Moreton Bay and their impact
- Summary of legislative steps required in key project types (e.g., restoration, research, threat reduction), with consideration to permit and approval processes
- Outlines five case studies that show how the legislation interacts in different project scenarios
- Regulatory barriers to implementing actions that improve the health of Moreton Bay are identified and discussed.

## C.2. Legislation relevant to Moreton Bay

There are many existing pieces of legislation that work towards protecting the values of coastal zones like Moreton Bay. Legislation is enacted for many reasons which has resulted in a complex suite of sometimes overlapping provisions that can make managing a natural area like Moreton Bay complicated. The purpose of this legislative review was to better understand the regulatory context within which rights and obligations for natural asset owners and users are governed and decisions are made that impact on the Bay. This assessment reviewed thirty-six federal, state and local government legislation that pertained to the values list generated for the Bay. The review of each piece of legislation was collated into a Table C1. Figure C1 summarises the key legislation reviewed and outlines any links to regulations, plans and policies and guidelines or plans that sit below them. A description of the relevant provisions that have influence on the listed values was included in the review along with a brief synopsis of the barriers, limitations and gaps.

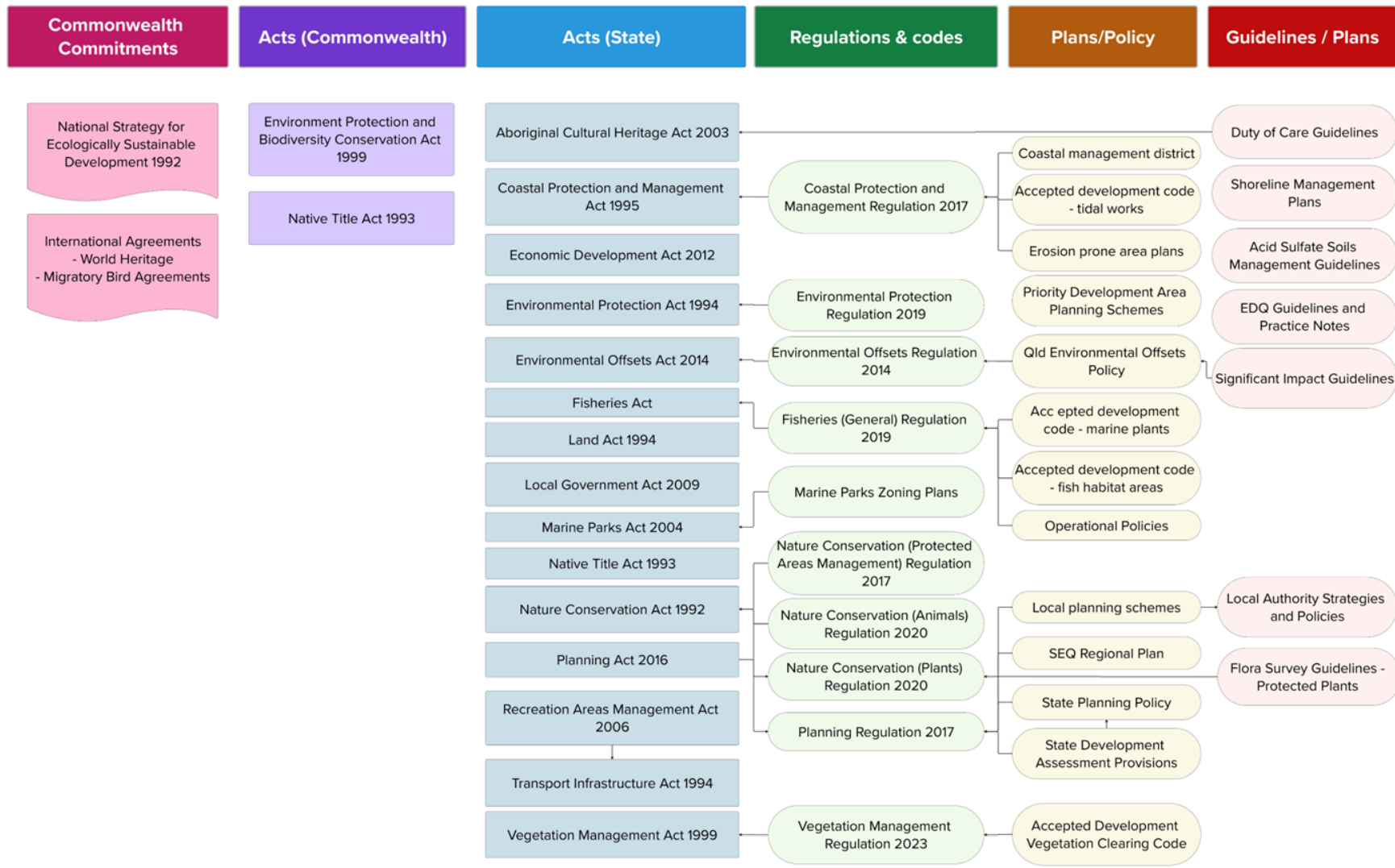


Figure C1. Summary of the legislation relevant to Moreton Bay that were reviewed and the links to regulations, plans and policies and guidelines or plans that sit below them.

**Table C1. Summary of analysis of regulatory barriers and gaps to protecting/mitigating Moreton Bay values/threats**

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
<b>International</b>				
Convention on Biological Diversity	Aims to conserve biological diversity at all levels and share in the benefits of genetic resources fairly.	Provides guidance / principles for embedding into local legislative instruments.	No real consequences for non-compliant jurisdictions.	Typically not directly embedded into the development of regulations (particularly for legislation that may have indirect impacts on the Bay such as land use change).
Convention on Conservation of Nature in the South Pacific	Aims to create protected areas and protect endangered species.	Provides guidance / principles for embedding into local legislative instruments.	No real consequences for non-compliant jurisdictions.	Typically not directly embedded into the development of regulations (particularly for legislation that may have indirect impacts on the Bay such as land use change).
Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention)	An international treaty that aims to conserve terrestrial, marine and avian species over the whole of their migratory range.	Provides guidance / principles for embedding into local legislative instruments.	No real consequences for non-compliant jurisdictions.	Typically not directly embedded into the development of regulations (particularly for legislation that may have indirect impacts on the Bay such as land use change).
Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention)	Aims to conserve significant wetlands and waterfowl by establishing nature reserves on wetlands. Moreton Bay is a Ramsar site.	Provides guidance / principles for embedding into local legislative instruments.	No real consequences for non-compliant jurisdictions.	Typically not directly embedded into the development of regulations (particularly for legislation that may have indirect impacts on the Bay such as land use change).
<b>Federal</b>				
Environment Protection and Biodiversity Conservation Act 1999	The EPBC Act provides a legal framework to protect and manage unique plants, animals, habitats, and places, including heritage sites, marine areas and some wetlands. In particular it protects matters of National Environment Significance such as Ramsar wetlands, listed threatened	The Environmental Assessment process to seek approval for any proposed action that is likely to have a significant impact on a matter protected by the EPBC Act, including matters of national environmental significance. There is a two stage process involving Referral (to determine whether or not a proposed action requires approval). If deemed	Only relevant for certain types of developments and/or scales of development.  Does not consider cumulative impacts well in practice.  Does not address indirect risks well (e.g. runoff).	Limited scope of application (limitations of triggers).

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
	species and ecological communities, and listed migratory species.	within 20 business days that the proposed action is a controlled action, it will be subject to the assessment and approval process under the EPBC Act.		
Inter-government Agreement on the Environment (1992)	Commits each state and territory to protect marine environments through a national system of marine protected areas – the National Representative System of Marine Protected Areas (NRSMPA). The NRSMPA aims to create a system of protected areas which represent a variety of marine ecosystems.	Largely sets broad principles and procedures that are implemented through State legislation.	Not a legislative requirement per se. Dated agreement that may not encompass best currently available information, science or thinking. This may not be a major issue as the State legislation is more directly relevant.	Does not represent broader suite of values. Any gaps may not be a major issue as the State legislation is more directly relevant.
National Strategy for Ecologically Sustainable Development 1992	A strategy that is designed to encourage decision-making and development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.	Focusses on principles and objectives rather than specific prescribed processes (e.g. decision should consider long-term objectives and outcomes).	Not a legislative requirement per se. Concepts and objectives are often challenging to define, particularly to a standard that can be implemented within a legislative instrument.	Any gaps may not be a major issue as the State legislation is more directly relevant.
Native Title Act 1993	An act that recognises the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws and customs and is intended to ensure those interests are addressed in development and the application of broader initiatives.	Provides for the recognition and protection of native title. Establishes ways in which future dealings affecting native title may proceed and to set standards for those dealings. Establishes mechanisms and processes for determining claims to native title. Provide for or permits, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.	Limited scope of interests and influence (where native Title applies only).	Legislation fills a specific gap, but is only truly effective when used as part of a broader suite of legislative instruments.
<b>State</b>				

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
Aboriginal Cultural Heritage Act 2003	An act to provide effective recognition, protection and conservation of Aboriginal and Torres Strait Islander cultural heritage. The Cultural Heritage Acts: provide blanket protection of areas and objects of traditional, customary, and archaeological significance.	Provides legislative processes for the recognition, ownership and management of Aboriginal heritage items and issues.	Limited scope of interests and influence.	Legislation fills a specific gap, but is only truly effective when used as part of a broader suite of legislative instruments.
Coastal Protection and Management Act 1995 Coastal Protection and Management Regulation 2017	An Act to provide for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity. It works alongside the Planning Act 2016 to guide land use planning and development assessment decisions on Queensland's coast. It provides a basis for the formulation of Strategic Coastal Management Plans (SCMPs), which may include provisions for sustainable development, conservation of natural values, and measures to address erosion and other coastal hazards.	<p>Certain tidal and operational works in the coastal zone can be classified as:</p> <ol style="list-style-type: none"> <li>1. excluded works of a minor or inconsequential nature</li> <li>2. accepted development</li> <li>3. coastal development that is triggered for assessment.</li> </ol> <p>Coastal development triggered for assessment needs to go through the development assessment process (under the Planning Act).</p> <p>Assessable coastal development:</p> <ol style="list-style-type: none"> <li>1. Operational work (tidal works; interfering with quarry material; disposing of dredge spoil or other solid waste in tidal water; constructing an artificial waterway; or removing or interfering with coastal dunes on land other than State coastal land in an erosion prone area</li> <li>2. Material change of use in a Coastal Management District</li> <li>3. Reconfiguring a lot in a Coastal Management District</li> </ol>	Does not cover indirect risks (e.g. diffuse loads from upstream).	Legislation fills a specific gap, but is only truly effective when used as part of a broader suite of legislative instruments.

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
Draft SEQ Regional Plan 2023 Update	The Queensland Government's long term vision and plan to accommodate future population growth, sustainably enhance communities, and maintain SEQ.	Sets out broad objectives and priorities for development and land use for the region.	Impact and effectiveness of Plan is limited to the extent to which it is implemented by local governments.	Plan is only truly effective when used as part of a broader suite of legislative and planning instruments and applied at the local government scale.
Economic Development Act 2012	The Act is the legislative framework to deliver infrastructure and property projects. The ED Act establishes a planning and development assessment framework that applies to declared priority development areas (PDAs) within the state. PDAs are parcels of land identified for accelerated land development with a focus on economic and community growth.	The Act can fast track development through the PDA process by allowing for shortened time frames by enabling development to reach the market sooner. Declaring an area as a PDA or a Provisional PDA provides a much quicker alternative to the State's standard planning approval process under the Planning Act 2016 (Qld).	Development within the PDA area will cease to be assessed under the standard process. Development will instead be subject to the faster process provided by the Economic Development Act 2012 (Qld). This means that developments will not need to be referred to other state agencies for interest checks and third parties will not have the opportunity to appeal the development. <sup>19</sup> An applicant can only appeal against a nominated assessing authority condition. If necessary, the Minister can introduce by-laws that apply within PDAs which would replace existing local laws.	PDAs can be declared in areas that have identified through other legislation (e.g. Marine Parks, Ramsar) for protection
Environmental Protection Act 1994 Environmental Protection Regulation 2019	An Act to protect Queensland's environment while allowing for development. The EP Act lists obligations and duties to prevent environmental harm, nuisances and contamination. Two primary duties that apply to all people in Queensland are the: <ul style="list-style-type: none"> <li>• General environmental duty – a person must not carry out any activity that causes or is likely to cause environmental harm, unless measures to prevent or minimise the harm have been taken.</li> </ul>	Chapter 3 outlines requirements for Environmental Impact Statements processes, to assess the potential adverse and beneficial environmental, economic and social impacts of the project; and to outline management, monitoring and other measures proposed to minimise adverse environmental impacts of the project. Stages of an EIS: <ol style="list-style-type: none"> <li>1. Terms of Reference (TOR) <ul style="list-style-type: none"> <li>• Drafting</li> <li>• Decision</li> </ul> </li> </ol>	Certain projects may still go ahead even where they will cause environmental harm, serious environmental harm, or environmental nuisance; if an EIS has been undertaken and approved by the government. In these circumstances the proponent will have conditions for approval to meet for undertaking the project.  Does not necessarily manage for cumulative damage and risks well.	Needs to better manage for cumulative damages and risks.

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
	<ul style="list-style-type: none"> <li>Duty to notify of environmental harm – when an incident has occurred that may have caused or threatens serious or material environmental harm.</li> </ul>	<ul style="list-style-type: none"> <li>Public notice</li> <li>Comments period</li> </ul> <p>2. EIS</p> <ul style="list-style-type: none"> <li>Submission (within 2 years from TOR)</li> <li>Decision on submission</li> <li>Public notice</li> <li>Comments and consultation on the EIS</li> <li>Provision of comments to the proponent (within 10 business days)</li> <li>Assessment by the chief executive (within 20 business days)</li> </ul> <p>3. EIS assessment report from chief executive (within 30 business days)</p>		
<p>Environmental Offsets Act 2014</p> <p>Environmental Offsets Regulation 2014</p> <p>General Guide for the Queensland Environmental Offsets Framework</p>	<p>An Act to counterbalance the significant residual impacts of particular activities on prescribed environmental matters through the use of environmental offset.</p> <p>Environmental offsets must achieve a conservation outcome for the impacted prescribed environmental matter.</p>	<p>Establishes a need and processes for the assessment and development of offsets.</p>	<p>Environmental offsets may be required by an administering agency as a condition of an authority if it will have an impact on a prescribed environmental matter.</p> <p>Offset conditions prescribed for matters of national environmental significance (under the EPBC Act 1999) cannot be imposed, delivered or legally secured under the Offsets Act because it has not been accredited by the Commonwealth Government. In the absence of accreditation, a referral may need to be lodged with the Commonwealth Government for assessment under the EPBC Act 1999.</p> <p>The Offsets Act allows for local government to require an offset for</p>	<p>Limited scope of application means residual damage and risks to Bay continue, particularly for activities that are not captured within offsets requirements.</p>

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
			Matters of State Environmental Significance, where it is prescribed. However there is no matter prescribed currently under the Offsets Regulation for which local government may require an offset.	
Fisheries Act 1994 Fisheries (Commercial Fisheries) Regulation 2019 Fisheries (General) Regulation 2009	Provides a legislative framework for the regulation of commercial fishing, recreational fishing, indigenous and coastal areas that are important as fisheries habitat and marine plants. It provides mechanisms aimed at the sustainable management of fisheries including management plans, quotas, offences, licences and declarations of closed seasons, closed waters, and fisheries habitat areas.	Authorities can be issued under the Act for a licence, permit, quota authority, resource allocation authority, or another authority prescribed by regulation. Authorities must be in the approved form and made to the chief executive. Authorities can be renewed (except for permits) (refer Division 3 of the Act).	A regulation may for the Planning Act state the requirements that fisheries development must comply with to be categorised as accepted development under that Act (Section 32).  May not adequately manage risks, particularly where implementation mechanisms such as quotas are not managed dynamically to reflect changes in external environment (e.g. climate change).	Stronger links to adjacent habitat and ecosystem services managed under other legislation.
Fisheries Declaration 2019 Fisheries Quota Declaration	Outline restrictions on particular fishing activities across all sectors, including regulated waters, regulated fish declarations (size, possession and form requirements) that apply to commercial and recreational fishers, and quota entitlements for commercial fisheries.	Largely administrative processes to underpin other legislative objectives.	N/A. Scope is well defined.	Only effective when used in conjunction with other legislation (e.g. Fisheries Act 1994).
Land Act 1994	Requires land administered under the Act to be managed for the benefit of the people of Queensland by having regard to seven principles: sustainability, evaluation, development, community purpose, protection, consultation and administration.	Application forms can be submitted to the Queensland Government lands department for use of state land.	None specifically as intentions of Act relevant to Bay are largely delivered via other legislation.	Legislation fills a specific gap, but is only truly effective when used as part of a broader suite of legislative instruments.

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
Local Government Act 2009	Provides for a way in which a local government is constituted and the nature and extent of its responsibilities and powers and a system of local government in Queensland that is accountable, effective, efficient and sustainable.	Processes relate to establish and running of local governments – not activities that directly impact on Bay.	None specifically as intentions of Act relevant to Bay are largely delivered via other legislation.	Legislation fills a specific gap but is only truly effective when used as part of a broader suite of legislative instruments.
Marine Parks Act 2004 Marine Parks Regulation 2017	Provides for the conservation of Queensland’s marine environment by implementing a comprehensive range of management strategies including the declaration of marine parks and the establishment of zones and designated areas, including highly protected areas within marine parks.	The Act provides for activities to be undertaken on marine parks under an authority (permits and commercial activity agreements) for varying periods. A ‘permit’ can include several ‘permissions’ for the conduct of different activities as prescribed in a relevant marine park zoning plan.	Limited provision for proactive or beneficial activities that are designed to improve value (e.g. restoration, coastal erosion protection). These are treated in the same way as development activities	Act could explicitly provide for restoration to enhance the values designated for protection
Marine Parks (Moreton Bay) Zoning Plan 2019	Provides the framework for managing the Moreton Bay Marine Park by outlining four types of zones that offer various levels of protection – general use, habitat protection, conservation park, and marine national park. Outlines what purposes can be undertaken within each zone.	Any activities	Zoning plan is good for protecting values but limits proactive or beneficial activities developed to improve value (e.g. restoration, erosion protection) which might be ultimately restricting what trying to achieve.	Lots of exclusions/exemptions in the zoning plan to allow for various maintenance of high use zones for extraction (e.g. for dredging) and spoil deposition areas. These should be under constant review.
Nature Conservation Act 1992 Nature Conservation (Animals) Regulation 2020 Nature Conservation (Protected Areas) Regulation 2017 Nature Conservation (Plants) Regulation 2020	Provides the legislative basis for the conservation of nature through the dedication, declaration and management of protected areas and the protection of native wildlife and its habitat.	Provides for activities to be undertaken on protected areas by permit, authority or agreement (approvals) and outlines the administrative matters relating to the grant, amendment, suspension, cancellation, surrender and replacement of the relevant approvals. Outlines a number of additional requirements and restrictions apply to certain activities and approvals on protected areas.	Areas with limited values currently but might represent significant opportunity for enhancement of values or critical ecological process in the future (e.g. to enhance connectivity between reserves or establishing a reserve for a buffer with sea level rise)	Act could explicitly provide for restoration to enhance the values designated for protection

Relevant plans/policies	Description	Prescribed processes	Barriers or limitations	Gaps
Planning Act 2016 Planning Regulation 2017	Establishes an efficient, effective, transparent, integrated, coordinated and accountable system of land use planning, development assessment and related matters that facilitates the achievement of ecological sustainability.	Established heads of powers and procedures for Planning.	Only indirect relevance to the Bay. Primarily implemented via local government planning schemes.	Legislation fills a specific gap, but is only truly effective when used as part of a broader suite of legislative instruments.
Recreation Areas Management Act 2006	Regulates the establishment, maintenance and use of recreation areas, with regard to conservation, cultural, recreational, production and education values.	Sets procedures for the gazettal, development and management of recreational areas.	Only applies to specific land use types.	Legislation fills a specific gap, but is only truly effective when used as part of a broader suite of legislative instruments.
Vegetation Management Act 1999 Vegetation Management Regulation 2023	Legislation to control the clearing of native vegetation and management of native vegetation for some land types.	Sets out restrictions and processes for vegetation management.	Does not apply across all land uses (largely irrelevant in urbanised catchments). Limited scope can contribute to major indirect risks (runoff from clearing and land use change).	Scope of coverage.
<b>Local</b>				
Local Planning Schemes: Brisbane City Plan 2014 Gold Coast City Plan Logan Planning Scheme MBRC Planning Scheme – City of Moreton Bay Redland City Plan Sunshine Coast Planning Scheme 2014	Local planning schemes set out the vision for development and planning requirements for local governments; including regulation of the way land, buildings and structures are used and developed.	Planning schemes establish processes and regulatory controls at the local government scale that influence the location and scale of developments (land use change) and subsequent (occasional) direct risks to Bay assets and indirect risks (particularly via runoff).	Planning schemes may not directly link to Bay objectives.	Ensure Bay objectives are embedded into planning schemes.

## C.2.1. Summary

*Note – this summary section is replicated from the Blueprint report.*

The results of the review are presented under four broad themes, with each theme representing a difference in the intent of legislation and the differences in outcomes for the Bay from that legislation (e.g. direct or indirect risk mitigation). Misalignment of legislation was identified as a key barrier to successful the management of Moreton Bay's values and threats. The sections below discuss the barriers and gaps for each theme.

### **Theme 1 – Legislation controlling land use**

This refers to legislation and planning that controls land use that results in drivers and pressures on the Bay. This type of legislation manages an indirect impact to the Bay as they are largely enacted in the catchment.

Under existing legislative and planning arrangements, there are several controls in place under local government planning schemes, and key legislation such as the *Environmental Protection Act 1994*, the *Environmental Protection Regulation 2019*, the *Economic Development Act 2012*, and the *Planning Act 2016*. In combination, these controls determine and constrain where future development and redevelopment occurs in the landscape and the conditions under which that development can legally occur. In rural landscapes, controls on intensification of land use largely fall outside legislative controls unless material change of use triggers are met. This represents a significant risk to the Bay's values.

The most significant barrier identified is that there are still residual risks to the Bay even if all activities are compliant with legislative and planning controls. Changes in land use still result in pollution runoff of total nitrogen, total phosphorus and total suspended sediment from urban development which still increases even if all regulatory performance requirements are met. In effect, the current legislative framework inadvertently locks in a system where development creates additional pressures on the Bay via higher loads of diffuse catchment pollutants that may be beyond the tolerance of Bay values. This in turn increases the scale of effort required to meet desired objectives for the Bay (including Ramsar obligations).

While it is not practical or efficient to stop all development of land, to the extent that residual risks to the Bay are not offset or more effectively controlled, the condition of the Bay's values will continue to be at risk of degradation and the scale of effort required to enhance the condition of the Bay will be greater. This is possibly the biggest risk to the Bay that could be managed through more effective and efficient legislation.

Legislative instruments are already partially in place to manage for residual risks to the Bay (the *Environmental Offsets Act 2014* and the *Environmental Offsets Regulation 2014*). However, the limited scope of land use activities to which they are applied means that residual risks continue.

### **Theme 2 – Legislation that reduces pressure on direct use of resources**

This theme refers to regulation and policies that relate to the pressures on the direct use of resources from the Bay. This type of legislation manages a direct impact to the condition of the Bay's values.

Pressures on direct use of the resources of the Bay are managed by a number of legislative instruments (e.g. *Fisheries Act 1994*, *Marine Parks Act 2004*, *Marine Parks Regulation 2017*, and *Marine Parks (Moreton Bay) Zoning Plan 2019*). These legislative instruments attempt to reduce the overall pressure on use of resources, while also excluding some activities from particularly sensitive zones or habitats (e.g. excluding fishing from marine protected areas). These legislative instruments are relatively blunt management instruments; however they are clear in their intent and informed by science. A significant gap is noted is that future impacts such as the effects of climate change could result in significant changes in assimilative capacities and tolerances of Bay values which is likely to reduce the effectiveness of the provisions in these pieces of legislation.

### **Theme 3 – Legislation that directly protects specific Bay values**

This theme refers to legislation and policies that relate to directly protecting specific Bay values. This type of legislation manages a direct impact on the condition of the Bay's values.

Direct damage to the values of the Bay can occur when developments and use of the Bay's values are destroyed or heavily modified for commercial purposes. A number of legislative instruments are particularly relevant to managing these risks to the Bay including the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the QLD *Economic Development Act 2012* the *Environmental Protection Act 1994*, *Marine Parks Act 2004*, *Marine Parks Regulation 2017*, and *Marine Parks (Moreton Bay) Zoning Plan 2019*. These legislative instruments either preclude development altogether in sensitive areas of the Bay and/or require performance requirement for commercial and public projects that would directly damage the values of the Bay (usually achieved through development approval performance requirements). The recent decision on the Toondah Harbour development is an example of the application of these legislative instruments.

Where development is allowable under these instruments, there will be residual damage to the Bay. While it is not practical or efficient to stop all development, to the extent that residual direct damage to the Bay is not offset, the condition of the Bay's values will continue to be at risk. This is possibly the biggest direct risk to the Bay that should be managed through more effective and efficient legislation.

Legislative instruments are already partially in place to manage these risks (the *Environmental Offsets Act 2014* and the *Environmental Offsets Regulation 2014*). However, the limited use of offsets means that residual risks continue.

### **Theme 4 – Legislation controlling “On-ground” research, conservation & restoration activities**

These are type of legislation and policies relating to on-ground works for habitat restoration. This type of legislation manages a direct impact on the Bay's values. Refer to Appendix C.2 for several case studies detailing existing pathways to on-ground projects and existing barriers.

A number of measures could be considered to reduce the legislative hurdles that prevent restorative work from being implemented within the Bay.

- Better collaboration with local authorities or State government agencies (particularly the Department of Environment and Science and Queensland Parks and Wildlife) to enable works to occur without the full weight of the regulatory requirements imposed on development activities.
- Update of accepted development codes to increase the scope of restoration and rehabilitation works to occur without the requirement for assessable development. Updates to the legislation could also include an approval system for not-for-profit organisations or other suitable entities responsible for the development and implementation of restoration programs, however this approach may require additional measures to be implemented across the sector to ensure the provisions only apply to eligible or pre-approved organisations.
- Development of a strategic plan across the entire Moreton Bay that makes space for rehabilitation work to occur. This may sit under an existing regulatory mechanism (such as the SEQ Regional Plan, or perhaps the Moreton Bay Marine Park Zoning Plan). Existing legislation may require amendment to enable works consistent with the nominated plan to be subject to accepted development codes.

This approach has not sought to modify the landowner consent provisions but has focussed on limiting the requirement for rehabilitation works to be assessable under all of the relevant legislative provisions.

### **Summary**

The current legislative arrangements that directly and indirectly impact on the Bay range from federal legislation through to the compliance with guidelines on practices to achieve performance targets under development approvals. Collectively these legislative arrangements allow for direct and indirect residual damages and risks to

the Bay, overtime locking in an accumulation of pressures and risks on the Bay. Perhaps the most notable risks relate to legislation that allows changes in land use within the catchments that ultimately lead to increased runoff to the Bay. In the absence of widespread use of instruments such as offsets, risks to the Bay will continue to increase, as will the efforts/costs required to meet Bay objectives and obligations.

## C.3. Identifying legislative pathways to projects

This section reviewed the legislative steps required in key project types (e.g., restoration, research, threat reduction), with consideration to permit and approval processes. Five case studies are outlined to demonstrate how the legislation summarised in Section C.2 interacts in different project scenarios. A summary of the barriers and recommendations to address those barriers is provided.

Coastal management in Queensland is bounded within the context of Commonwealth and State legislation, as well as local authority planning schemes. The legislation results in a complex structure of rights and responsibilities, particularly surrounding the implementation of coastal works. This section provides a summary of the key legislative and planning requirements that may impact how coastal related projects are undertaken in Moreton Bay and how the recommendations of this project are affected by those requirements.

Key legislation relevant to coastal planning within Moreton Bay are outlined in Figure C1. Any proposed land management options will need to comply with all relevant legislation. Noting that approvals processes that may be required for coastal management actions. For coastal works undertaken by or on behalf of a public sector entity, the provisions of the local planning scheme do not apply by virtue of Schedule 6, Part 3, Section 8 of the Planning Regulation 2017. The legislative framework and associated approval requirements will be considered in determining the feasibility and appropriateness of any options proposed within Moreton Bay.

The following case studies have been developed to provide examples of how the legislation interacts for different types of projects.

### C.3.1. Case Study 1: Field-based research project

Consideration has been given to obtaining a mangrove sample from the habitat protection zone of the Moreton Bay Marine Park as shown in Figure C2.

While field based research does not typically comprise assessable development under the *Planning Act 2016*, some activities may result in regulatory approvals being required. This includes:

- Disturbing marine plants where unable to comply with the *Accepted Development Requirements for operational work that is the removal, destruction or damage of marine plants 2017*, such as having to create an access track through marine plants to a sampling location
- Works that occur in a fish habitat area where the proponent is unable to comply with the *Accepted Development Requirements for operational work that is completely or partly within a declared Fish Habitat Area*
- Investigative works to carry out research beyond the minor investigative works permitted for accredited education and/or research institutions within the habitat protection zone of the Moreton Bay Marine Park.

Additional regulatory requirements may apply with respect to Aboriginal cultural heritage where the works may potentially impact areas or objects of Aboriginal cultural heritage. A significant Aboriginal area or object must be particularly significant to Aboriginal people because of either or both of the following:

- Aboriginal tradition
- the history, including contemporary history, of any Aboriginal Party for the area.

Section 23(1) of the *Aboriginal Cultural Heritage Act 2003* states that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage. This may require liaison with the Aboriginal party for the area in which research is to be undertaken.

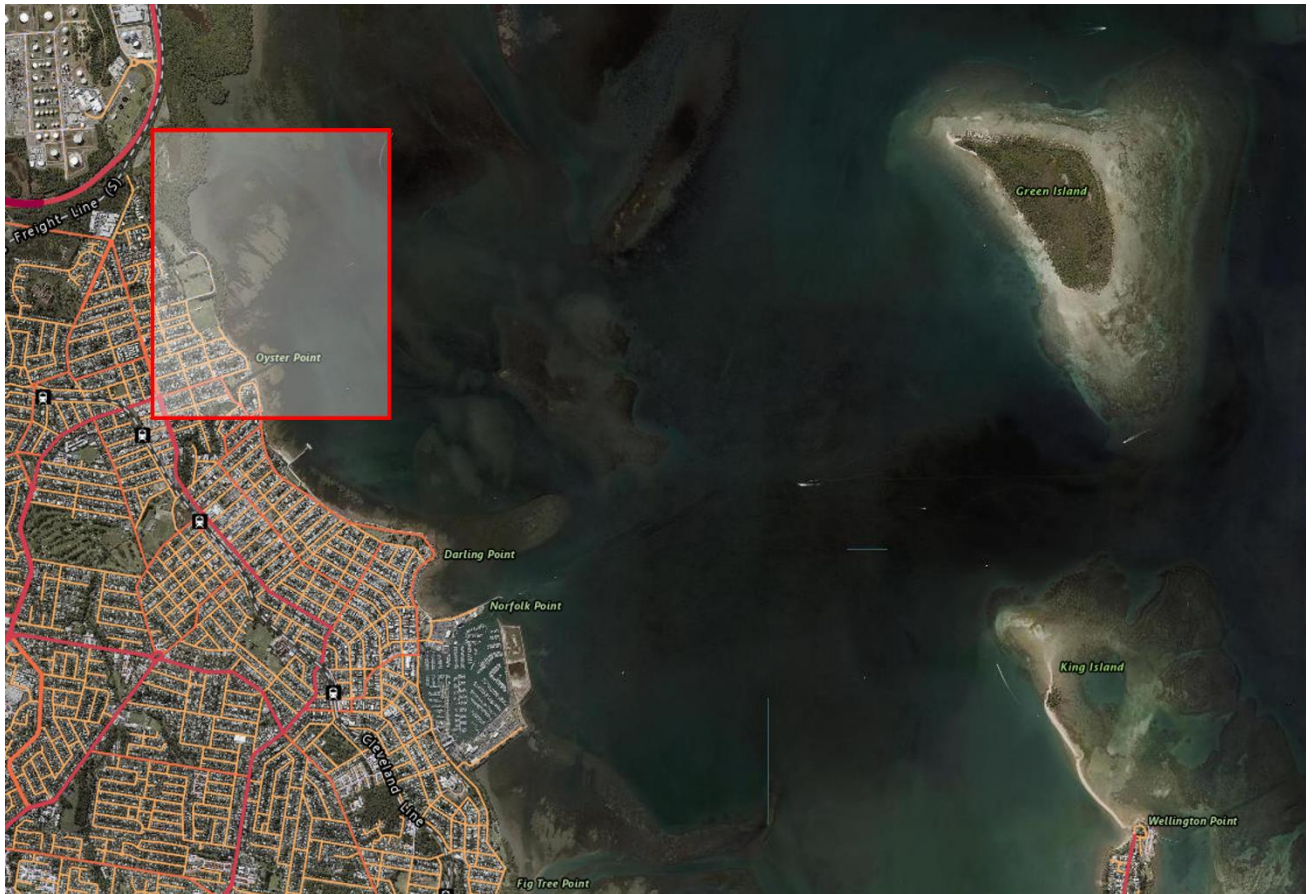


Figure C2. Hypothetical mangrove sampling location for research within the Moreton Bay Marine Park

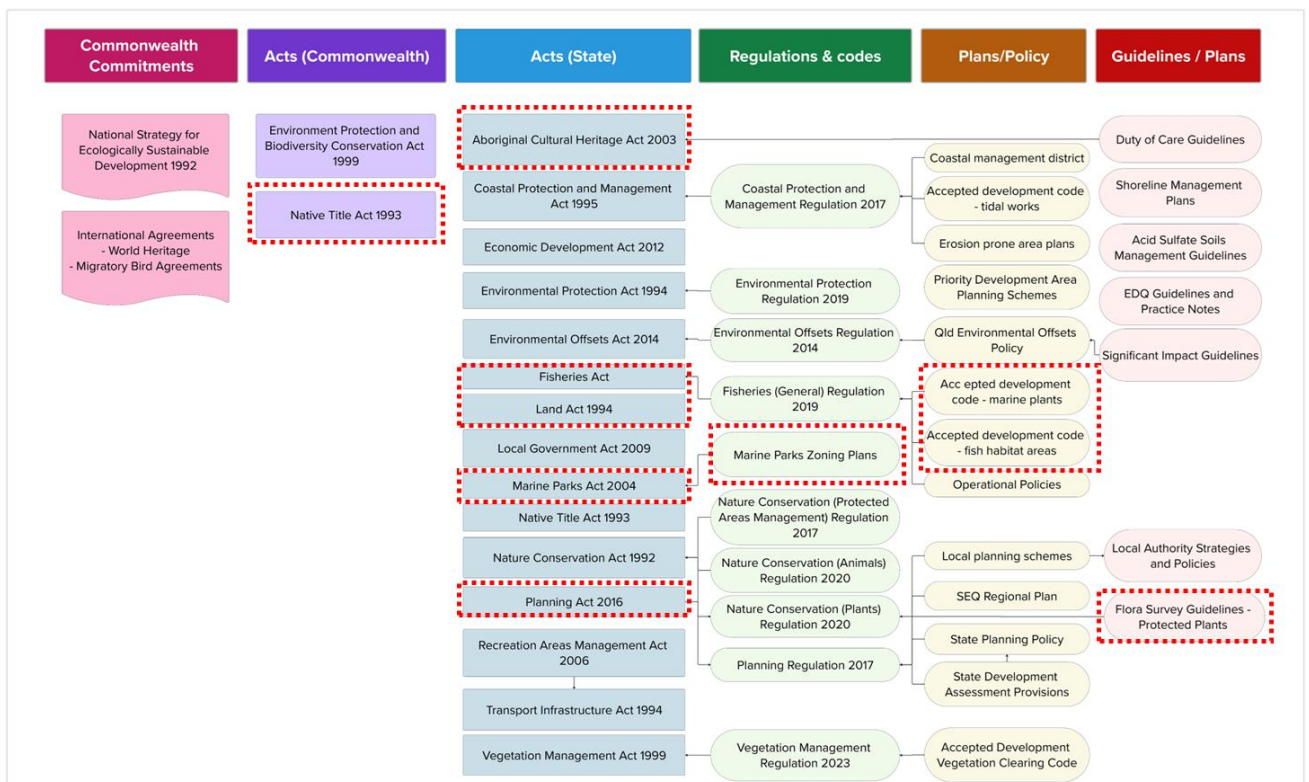


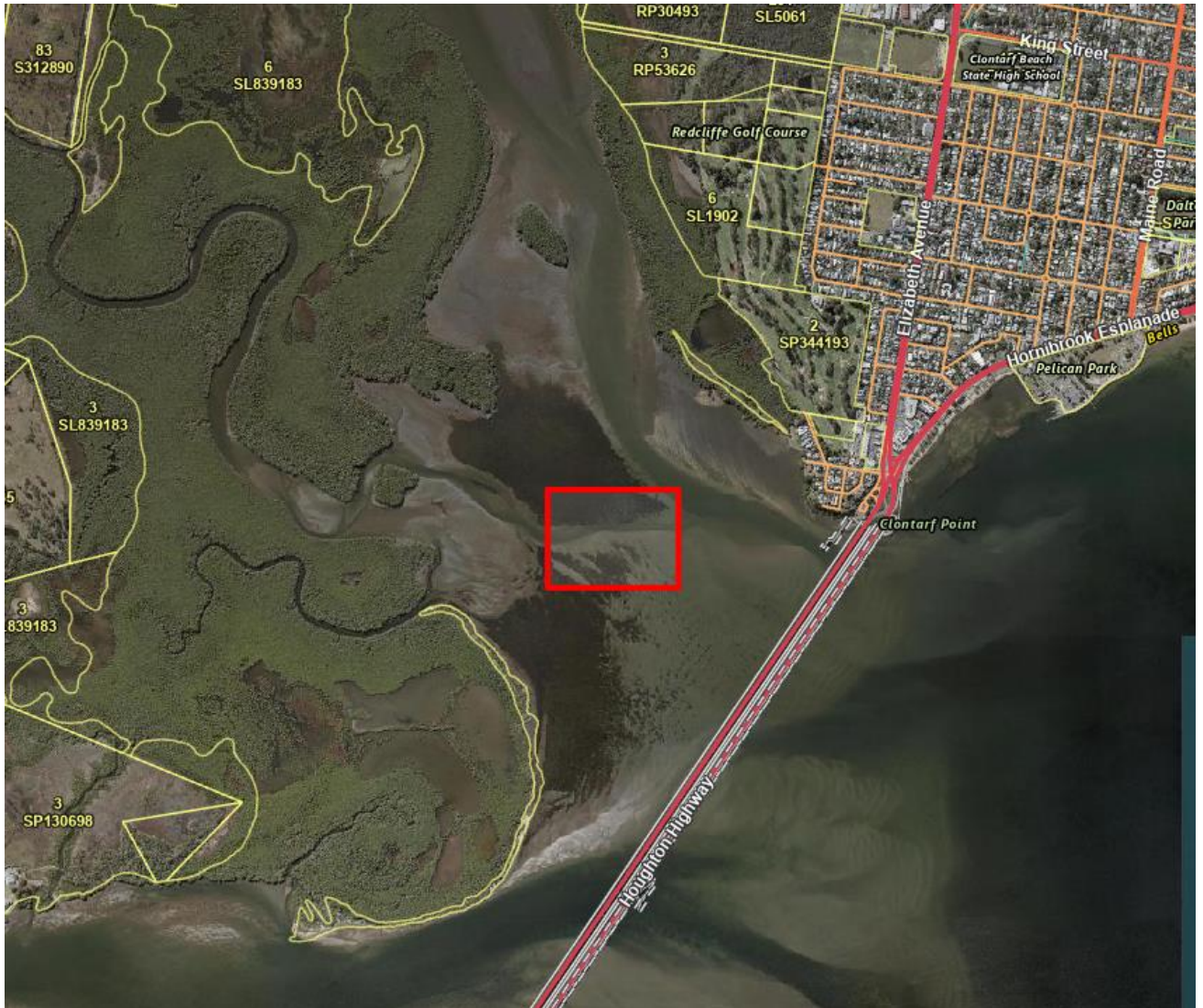
Figure C3. Pathways to project diagram (approval pathways) - Case Study 1: Field-based research project (e.g. mangrove sampling, fish assemblages, turtles, seagrass)

### C.3.2. Case Study 2: Artificial Shellfish Reef – Hayes Inlet

The option of installing an artificial shellfish reef in Hayes Inlet has been considered (refer approximate location in Figure C4) The area nominated is situated on unallocated State land within the conservation park zone of the Moreton Bay Marine Park, which is a highly protected zone and offsetting is required for any impacts to this area. The land is within a coastal management district, supports sea grass and is likely to support acid sulfate soils. Further, Hayes Inlet / Bramble Bay is a navigable channel under the interest of Maritime Safety Queensland which is a regulatory team within the Queensland Government Department of Transport and Main Roads. This area is also mapped within a fish habitat area declared under the Fisheries Act 1994.

The installation of an artificial shellfish reef is likely to be perceived as prescribed tidal works, being works in, on or above land under tidal water and may also include works designed to prevent the erosion of land by the sea where this is intended to be used to mitigate erosion risk.

Works are likely to be subject to an operational works development application for prescribed tidal works, with referral required to the State Assessment and Referral Agency for tidal works, works in a fish habitat area and impacts to marine plants where encroachment into the areas of seagrass occurs. Landowner consent will be required where assessable development occurs below MHWS, and a resource allocation authority is necessary for works within a fish habitat area. No application can be made without landowners consent being granted and without a secondary interest in the land (typically implied through an act of Parliament, such as the Local Government Act 2009 for local councils), there may be difficulties in obtaining land owner consent without seeking a seabed lease from the Queensland Government Department of Resources. This has significant time and financial costs and may not be supported where the seabed lease is deemed to be a future Act, resulting in the extinguishment of native title over the land. The State holds a policy position of non-extinguishment at present.



**Figure C4. Hypothetical location for artificial shellfish reef**

Impacts to marine plants may be difficult to justify if other options exist to locate the artificial shellfish reef in areas where no marine plants are present. The requirement for offsetting may be applied for impacts to marine plants and undertaking works in a highly protected zone of a marine park where a residual significant impact on values associated with these attributes remains. This is determined by reference to State guidelines and offsets may be delivered as a land based offset, as cash in lieu or a mix of both. There may be an argument in this instance that the nature of the structure creates fish habitat and allows greater colonisation of the area by marine plants.

A marine park permit would also be required as the works seem to fall under the purposes for which a person may enter or use an area in the conservation park zone with a permission.

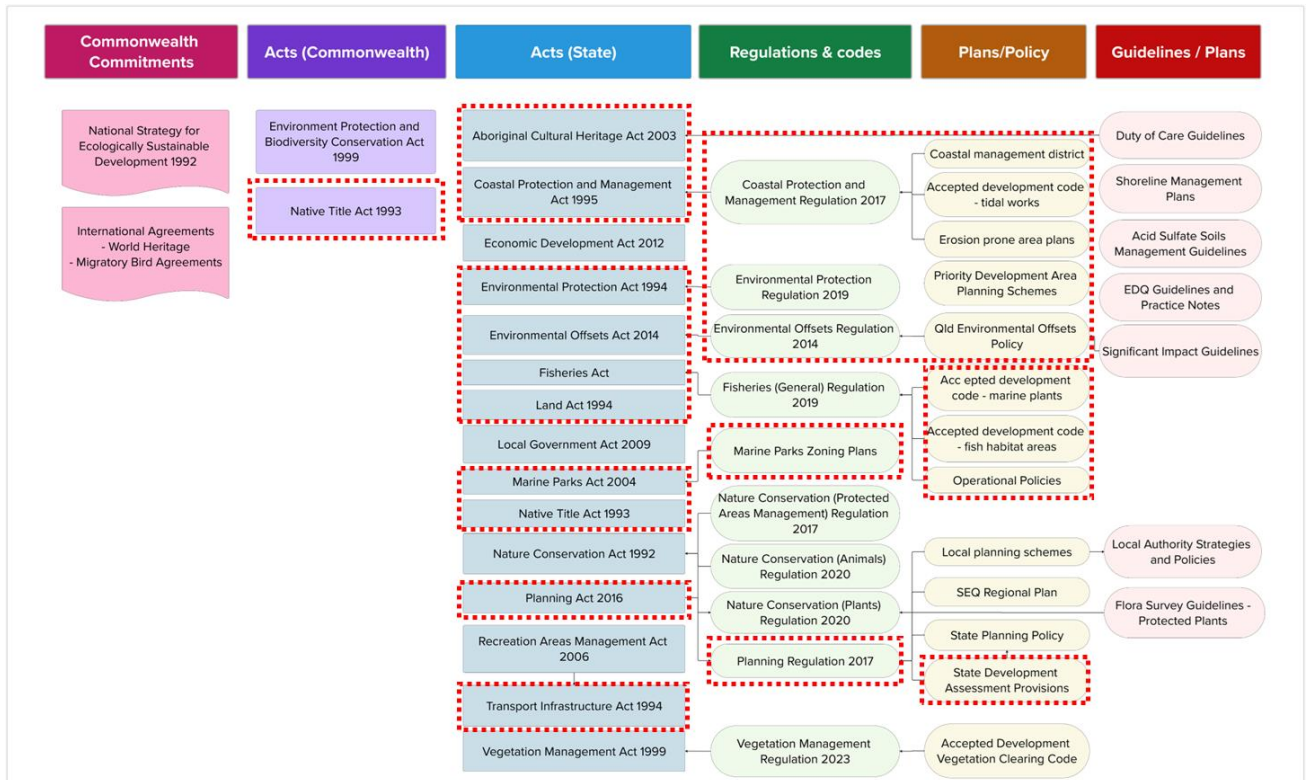


Figure C5. Pathways to project diagram (approval pathways) - Case Study 2: artificial shellfish reef restoration

### C.3.3. Case Study 3: Land-use conversion and wetland restoration

Wetland rehabilitation opportunities exist for the abandoned prawn farm off Rocky Point Road, Steiglitz due to its proximity to Moreton Bay (refer Figure C6). The land comprises three allotments described as Lot 153 on SP104025, Lot 374 on SP104025 and Lot 15 on CP861652. Lot 153 on SP104025 is under freehold tenure however this is bisected by a road corridor and several small areas of lands lease tenured land. Lot 374 is also under freehold, tenure while Lot 15 is mapped as national park. Elements of the former use also appear to extend onto the unallocated State land associated with Moreton Bay to the east. A portion of Lot 153 and all of Lot 374 and Lot 15 are situated within a coastal management district.



Works within national park tenured land must be approved by Queensland Parks and Wildlife Service under the Nature Conservation (Protected Areas Management) Regulation 2017. This approval is separate to the development permit nominated under the Planning Act 2016 for prescribed tidal works or disturbing quarry material above high water mark on State coastal land.

A marine park permit would also be required as the works seem to fall under the purposes for which a person may enter or use an area in the habitat protection zone or general use zone with a permission.

The requirement for offsetting may be applied for impacts to marine plants or impacting a fish habitat area where a residual significant impact on values associated with these attributes remains. This is determined by reference to State guidelines and offsets may be delivered as a land based offset, as cash in lieu or a mix of both. There may be an argument in this instance that the nature of the works will facilitate an increase in the area of marine plants over time. Similar arguments could be applied for works within the national park tenured land.

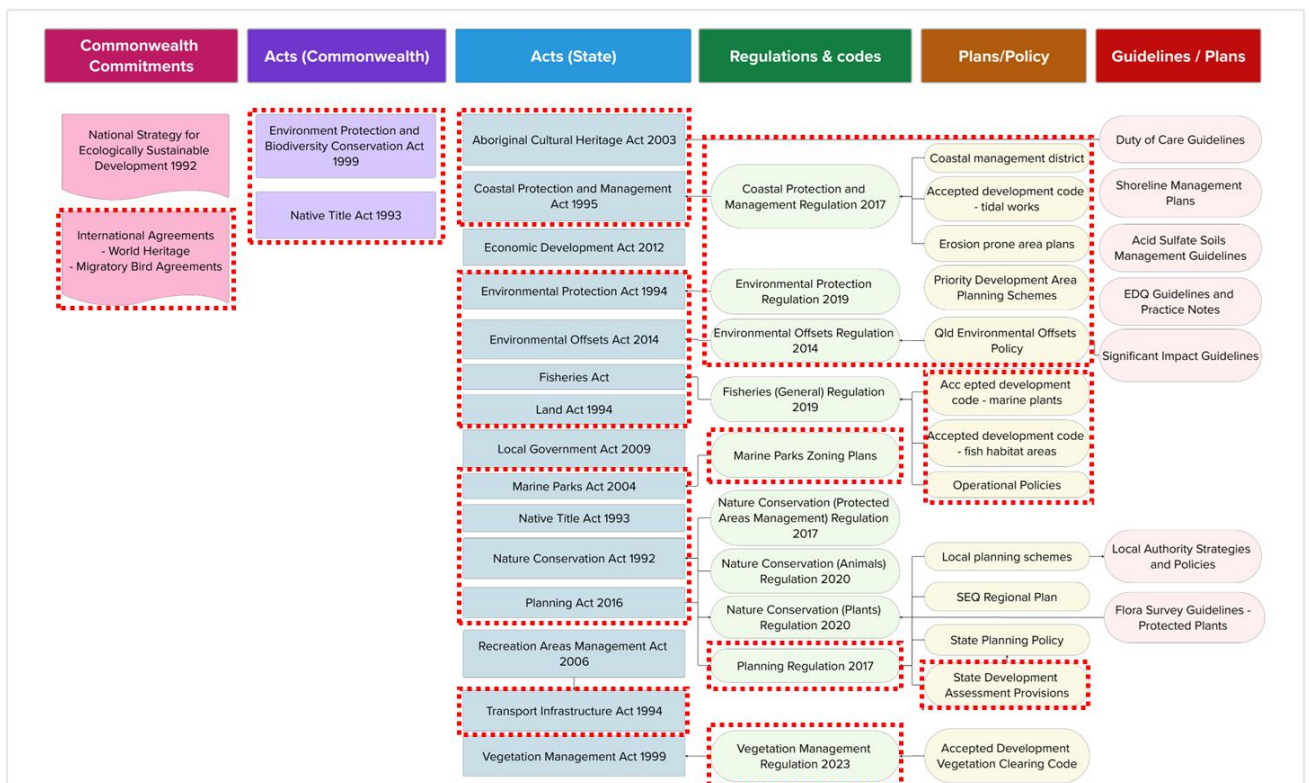


Figure C7. Pathways to project diagram (approval pathways) - Case Study 3: Land-use conversion and wetland restoration

### C.3.4. Case Study 4: High-value palustrine wetland restoration

Protection of the Eighteen Mile Swamp on the eastern side of Minjerribah (North Stradbroke Island) through retention and enhancement works may have significant long term benefits for the health of this ecosystem and associated ecological processes (refer Figure C8).



**Figure C8. Potential location for high value wetland restoration on the east side of Minjerribah (North Stradbroke Island).**

The land comprises several allotments, with the largest described as Lot 1 on NPW1121 and comprises national park protected under the *Nature Conservation Act 1992*. Vehicle tracks extend across the national park from land in freehold tenure to the west and continue onto the eastern beach. The national park land is mapped within a coastal management district and is also mapped as supporting remnant vegetation. Freshwater Creek which is mapped as extending through the swamp parallel to the coastline is also mapped as a high risk waterway for a waterway barrier to fish passage.

Works within this area may include removal of the culverts and roadway in select locations to enhance connectivity of the wetland ecosystem, and treatment of weeds and removal of pest fish species inhabiting the waterways.

Depending on the scope of works proposed, restoration works involving bulk earthworks to remove or modify existing vehicle accesses, including culverts will involve disturbing quarry material on State land above high water mark. Accordingly, works are likely to be subject to an operational works development application with the application lodged directly with the State Assessment and Referral Agency. Where impacts to mapped remnant vegetation occur in a manner that is not consistent with the exemptions in Schedule 21 of the *Planning Regulation 2017* and cannot comply with the accepted development codes for vegetation clearing on freehold land outside of the national park, an application may also be required for impacting native vegetation. In such instances, a relevant purpose determination would also be required to be obtained from the Queensland Government Department of Resources before any application could be made.

Culvert works or temporary water crossings for the removal or upgrade of culverts will be required to comply with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works*. This permit works to occur in a manner that removes the requirement for an approval. Where works cannot be completed in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works*, an operational works development permit will be required for raising a waterway barrier works and will require assessment by the State against the relevant code under the State Development Assessment Provisions.

Works within national park tenured land must be approved by Queensland Parks and Wildlife Service under the *Nature Conservation (Protected Areas Management) Regulation 2017*. This approval is separate to any

development permit nominated under the *Planning Act 2016* for disturbing quarry material above high water mark on State coastal land or raising a waterway barrier. A Statement of Works is typically required to demonstrate how the objects of the Act can be satisfied with regard to the protected area and covering the works proposed.

The requirement for offsetting may be applied for impacts to matters of State environmental significance where a residual significant impact on values associated with these attributes is associated with the works. This is determined by reference to State guidelines and offsets may be delivered as a land based offset, as cash in lieu or a mix of both. There may be an argument in this instance that the nature of the works will facilitate a net environmental benefit.

Where works involving replacement and road upgrades are proposed and these are undertaken in association with a local government and/or the State, there may be capacity to avoid assessment against the Redland City Plan which is the local government planning scheme that regulates works within the area.

The coastline is regulated under the *Recreation Areas Management Act 2006* which imposes additional constraints on vehicle operation and other matters on the Island’s beaches and camping areas.

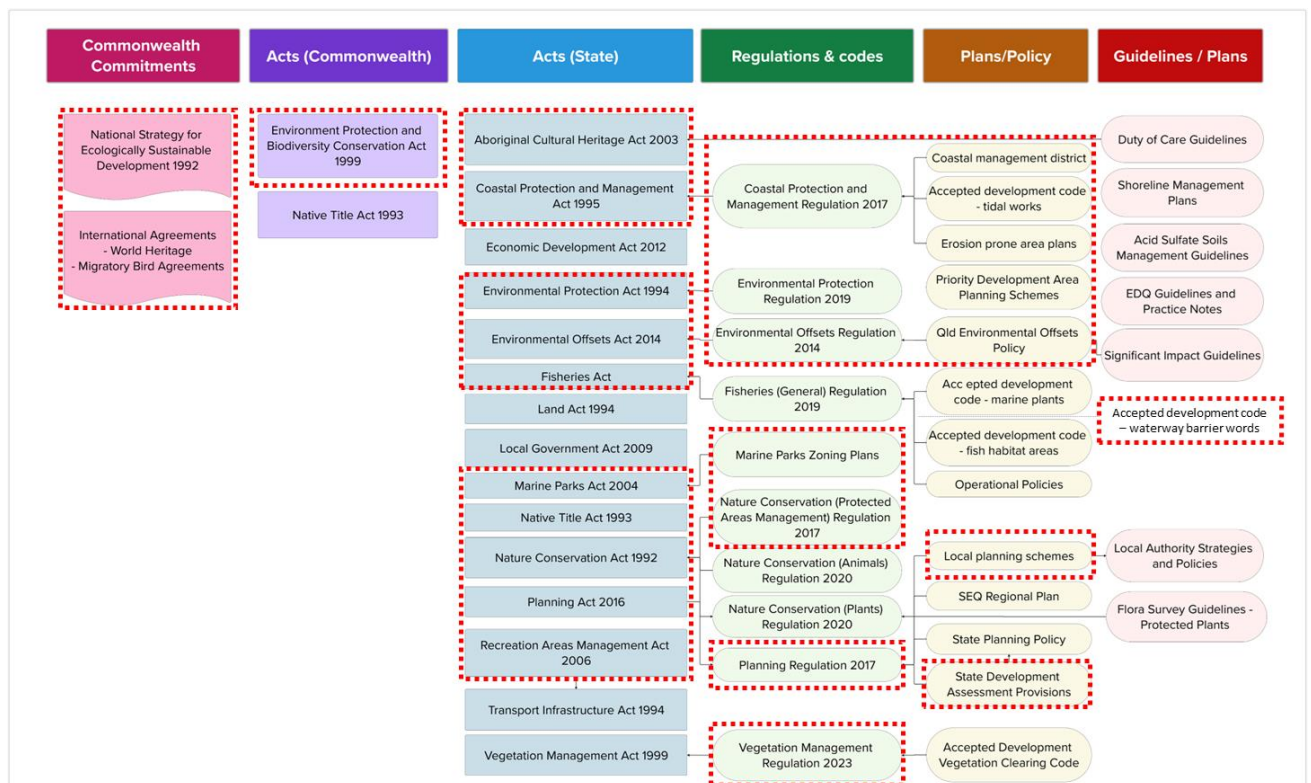


Figure C9. Pathways to project diagram (approval pathways) - Case Study 4: high-value palustrine wetland restoration

### C.3.5. Case Study 5: Dune revegetation and/or beach nourishment solution (as an alternative to hard structure engineered solution (e.g. rock revetment wall) for coastal community protection)

The Toorbul Esplanade foreshore is a mix of seawalls, mangroves, and muddy and sandy beaches. The sites are within a Moreton Bay Marine Park conservation park zone, and bordered by a declared fish habitat area, including three identified shorebird habitat areas. The NMB-SEMP (BMT, 2014) identified that the existing

seawalls along the Esplanade shoreline vary in design and condition. With some seawalls in very poor condition and showing significant deterioration, there is opportunity to reinstate restoration measures as an alternative to replacing the existing seawalls (refer Figure C10).



**Figure C10. Hypothetical location for beach nourishment and restoration options**

Key legislation relevant to coastal planning within Moreton Bay Regional Council’s jurisdiction is outlined in Figure C11. Any proposed management options will need to comply with all relevant legislation. For coastal works undertaken by or on behalf of Moreton Bay Regional Council, the provisions of the local planning scheme do not apply by virtue of Schedule 6, Part 3, Section 8 of the *Planning Regulation 2017*. For entities other than public sector organisations with legislative requirements to undertake works within this area the provisions of the planning scheme are still likely to apply.

Proposed restoration works considered include partial removal of the deteriorated sections of the existing seawall and replace with gravel beaches. This option is combined with the rehabilitation of the existing stormwater outlets to natural outlet structures and revegetation to provide a stable transition from a constructed drainage system to a natural flow regime.

This option will require further consideration of the following:

- Gravel sizing and grading;
- Beach slope; and
- Movement threshold.

Works are likely to be subject to an operational works development application for prescribed tidal works to the local authority, with referral required to the State Assessment and Referral Agency for tidal works and impacts to marine plants where encroachment into areas supporting marine plants occurs. The likelihood of the works being considered accepted development with regard to tidal works is limited, even where the work is undertaken in concert with a local government due to the importation of gravel which does not match the particle size of material at the beach. Where assessable development occurs below MHWS, land owner consent would be required prior to the application being made. Land owner consent may be difficult where a secondary

interest in the land is not conveyed under legislation, like it is for local governments. Impacts to marine plants may be difficult to justify if other options exist to retreat by moving the top bank landward. Where marine plants are located in the reserve tenured land, offsetting for marine plants may be able to be avoided given the urban zoning of the land, or where the Queensland Government Department of Agriculture and Fisheries agree to the work comprise a rehabilitation plan for mangroves. Offsets may be required for permanent loss of marine plants within the USL where the works are not considered to comprise a rehabilitation plan. The works should seek to remain outside of the extent of the fish habitat area or the application will also require referral for assessment against State code 12.

A marine park permit would also be required for works within the habitat protection zone. Any excavation below the water table that exceeds 1,000m2 would constitute an environmentally relevant activity under Schedule 2 of the *Environmental Protection Regulation 2019* and would require assessment against State code 22.

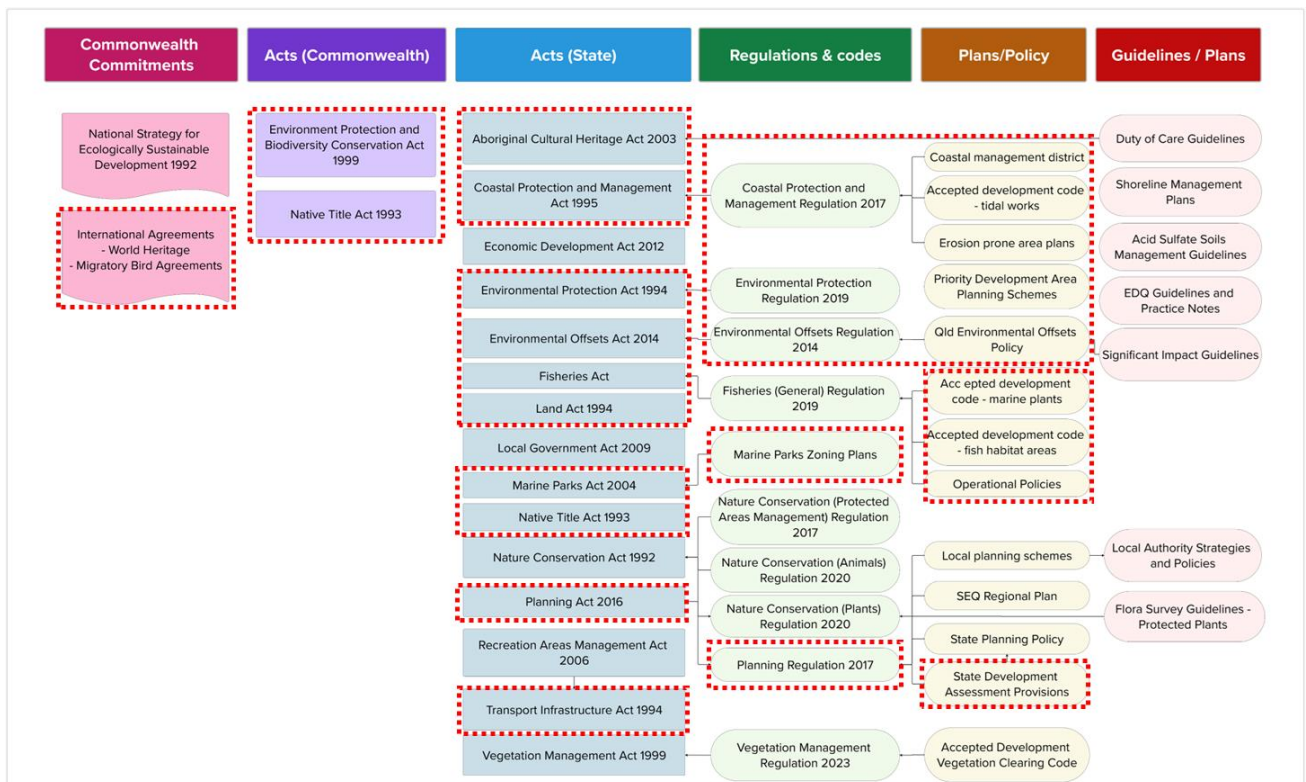


Figure C11. Pathways to project diagram (approval pathways) - Case Study 5: coastal community protection solution

### C.3.5.1. Summary

From the examples above, it is apparent that there are a number of regulatory hurdles that are likely to apply where restoration works are proposed outside of the scope of a direct government initiative. Regulation of activities by the local government’s planning scheme is typically exempted for local authorities and State government departments authorised under a State law to undertake the work. Various provisions also apply that make works completed by government entities exempt or accepted development under various regulations relating to natural resource management. These exemptions or accepted development provisions do not always apply to private sector entities or not for profit entities.

These measures create additional time and financial costs and in some instances, preclude the implementation of restorative measures within Moreton Bay.

Of particular note, any works occurring below the mean high water mark that is assessable development under the legislation and will require land owners consent. This is typically obtained for State land from the Department of Resources. The Department is typically constrained by only providing land owner consent to entities having a secondary interest in the land – either by way of legislation (such as a local government under the *Local Government Act 2009*) or where a seabed lease has been created and issued to an entity. Seabed leases are expensive and time consuming to set up and are also constrained by the government’s preferred position of non-extinguishment in relation to native title.

### **C.3.5.2. Recommendations/needs**

A number of measures have been documented that could be considered to reduce the legislative hurdles that prevent restorative work from being implemented within Moreton Bay.

- Better collaboration with local authorities or State government agencies (particularly the Department of Environment and Science) to enable works to occur without the full weight of the regulatory requirements imposed on specific activities
- Update of accepted development codes to increase the scope of restoration and rehabilitation works to occur without the requirement for assessable development. This could also increase the scope of application to not for profit organisations or other suitable entities responsible for the development and implementation of rehabilitation programs, however this approach may require additional measures to be implemented across the sector to ensure the provisions only apply to eligible organisations
- Development of a strategic plan across the entire Moreton Bay that makes space for rehabilitation work to occur. This may sit under an existing regulatory mechanism (such as the SEQ Regional Plan, or perhaps the Moreton Bay Marine Park Zoning Plan). Existing legislation may require amendment to enable works consistent with the nominated plan to be subject to accepted development codes.

This approach has not sought to modify the land owner consent provisions but has focussed on limiting the requirement for rehabilitation works to be assessable under all of the relevant legislative provisions.

The background features a series of overlapping, wavy shapes in various shades of green and teal. A light green shape is at the top, followed by a light greyish-green shape, and a dark teal shape at the bottom. The shapes overlap to create a layered, organic effect.

# Appendix **D**

## Options Assessment & Prioritisation

## D.1. Purpose of Appendix D

This document is an appendix to the *Blueprint for a sustainable Moreton Bay for people and nature (2025-2035)*, prepared by Natural Capital Economics on behalf of The Moreton Bay Foundation. The purpose is to provide additional details of tasks undertaken to inform development of the Blueprint, including the selection and prioritisation of actions.

In developing the Blueprint, several tasks were used to identify the key gaps in knowledge and management of Moreton Bay and the role the plan and TMBF could play in filling these gaps. These included:

- Stakeholder engagement;
- Consultation with the Minjerribah Moorgumpin Aboriginal Elders in Council (MMEIC) and Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC);
- Review of existing plans and regulatory frameworks; and
- Gap analysis of existing knowledge

The outcome of these activities was a comprehensive list of interventions (actions) for mitigating risks and threats and improving the health of Moreton Bay. The actions were integrated into 9 programs for assessment. A multi-criteria analysis (MCA) framework was developed to assess the programs to determine their relative benefits and costs and to inform prioritisation of interventions. Here we describe details of the MCA approach.

The Moreton Bay Foundation was given the opportunity to provide feedback on the MCA scoring and results (via a survey), and their feedback was used to revise the criteria and scoring and has informed the final list of prioritised programs.

## D.2. Rationale for the Multi-Criteria Analysis (MCA) approach

MCA provides a broadly accepted analytical framework and approach to assess interventions and actions for natural resource management.

It is a decision support tool that was developed as part of a field of study called “operations research”, where decision makers attempt to assess multiple options across a range of decision factors (reasons or considerations) that may have different and inconsistent assessment measures, including non-monetary valuation. MCA has been adopted for environmental management as it is valuable for assessing unique elements of a project that do not include financial components. Put simply, it is valuable as a technique for “comparing apples and oranges”.

When applied with care and transparency, an MCA can provide a structured and easy-to-use framework for comparing options. Within an investment and implementation plan (i.e. this blueprint), it can be an important contribution to the analysis, as it can provide a means of incorporating the relative impact (positive or negative) of different options in achieving management objectives.

Typically in an MCA, weightings are applied to each of the categories of criteria (e.g., ecological, economic, social, and cultural, cost-effectiveness, effectiveness/feasibility of method) to reflect their relative importance to decision-makers and stakeholders. Then under each objective, there are several relevant criteria against which each project is assessed. These criteria are also typically weighted within the objective to reflect their relative importance. The assessments against each criterion can use either the outputs of previous technical analysis (e.g., SMP decision support tool), or use a semi-qualitative approach based on expert discussion and/or

community engagement. It is this approach that allows very different considerations to be incorporated into the same framework of options evaluation.

Importantly, MCA is an acceptable approach used within the Queensland and Australian Government Business Case Decision Framework. In effect, by using and MCA process within this project, the initial assessment required by external investors will be partially met and the pathway to securing external investment should be more straightforward.

## D.3. Plan values and action themes - TMBF endorsed

One of the aims of the MCA framework is to assess the degree to which a program directly or indirectly contributes to the overall goals / objectives of the program. As agreed with TMBF project team, the aspiration goal of the Blueprint will be that the Bay's unique values are protected, and key threats are managed. For the purpose of this Blueprint the Moreton Bay values have been grouped under the following values themes:

1. **Resilient natural & unique ecosystems**
2. **Coastal living**
3. **Traditional Owner cultural values**
4. **Community connection & stewardship**
5. **Access & recreation**
6. **Sustainable use of ecosystems**

As such, you will see that the MCA criteria presented in the following sections align with these value themes.

## D.4. MCA structure

The basic structure of the MCA is shown in Figure D1Figure D1. This also shows how the criteria link back to the overarching values of the Plan. The scores and weightings will be described in detail in the following sections.

You may note that we have not included the Traditional Owner cultural values as a criteria in the MCA, this is deliberate. MMEIC and QYAC have identified their priorities and these objectives were included at a higher level and within the implementation principles of the plan. It is not appropriate for EcoFutures and TMBF to rank Traditional Owner values through this MCA process.

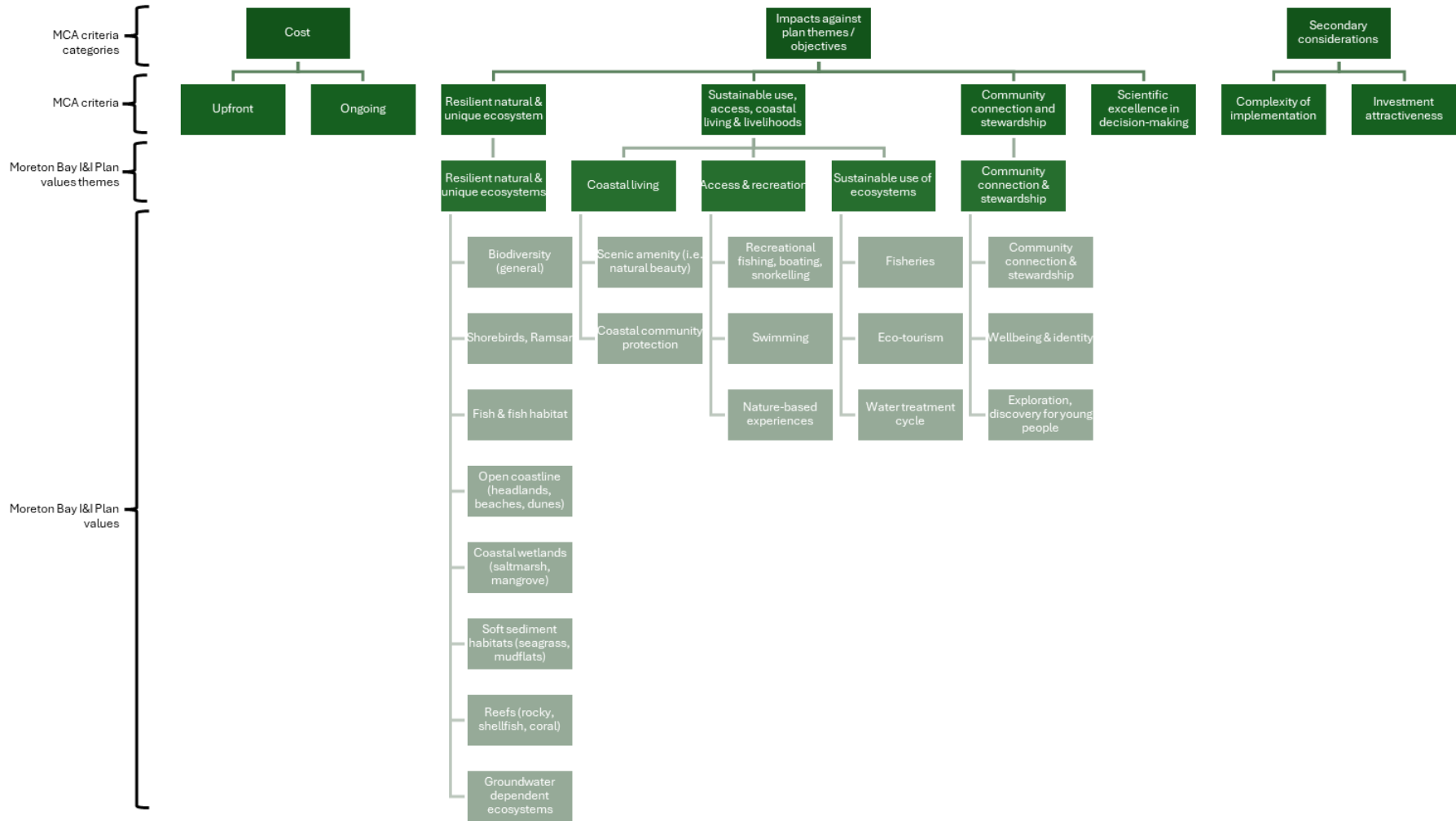


Figure D1. A summary chart of the MCA criteria and the underlying values. The weighted scores for each criteria are presented as a percentage of the final score.

## D.5. Criteria and scoring approach

The following Tables (Table 1 and Table 2) describes the MCA criteria, the 5-point scoring framework and associated weightings that have been developed. All 9 programs have been scored against each of these criteria, then a final score is calculated combining the scores for each criteria and applying a weighting for each score (as per **Table 2**).

**Table 1** The MCA criteria and scoring framework

Category	Criteria	Description	-2	-1	0	1	2
Cost of initiative to Moreton Bay Foundation and partners	Upfront cost	Cost required to implement the action.	\$1M+	\$500K-\$1M	\$200K-\$500K	\$50K-\$200K	\$0-\$50K
	Ongoing cost	Annual cost required to maintain the action outcomes in the long term.	\$200K+	\$101K-\$200K	\$51K-\$100K	\$11K-\$50K	\$0-\$10K
Impacts (direct and indirect) against themes (think of these as achieving an output or outcome)	Resilient natural & unique ecosystem (direct)	Degree to which an action directly contributes to achieving the goal of a resilient natural & unique ecosystem.	Significant negative impact		Neutral impact		Significant positive impact
	Resilient natural & unique ecosystem (indirect)	Degree to which an action indirectly contributes to achieving the goal of a resilient natural & unique ecosystem.	Significant negative impact		Neutral impact		Significant positive impact
	Sustainable use, access, coastal living & livelihoods (direct)	Degree to which an action directly contributes to achieving the goal of sustainable use, access, coastal living & livelihoods.	Significant negative impact		Neutral impact		Significant positive impact
	Sustainable use, access, coastal living & livelihoods (indirect)	Degree to which an action indirectly contributes to achieving the goal of sustainable use, access, coastal living & livelihoods.	Significant negative impact		Neutral impact		Significant positive impact
	Community connection and stewardship (direct)	Degree to which an action directly contributes to achieving the goal of community connection and stewardship.	Significant negative impact		Neutral impact		Significant positive impact
	Community connection and stewardship (indirect)	Degree to which an action indirectly contributes to achieving the goal of community connection and stewardship.	Significant negative impact		Neutral impact		Significant positive impact
	Scientific excellence in decision-making (direct)	Degree to which an action directly contributes to achieving the goal of scientific excellence in decision-making.	Significant negative impact		Neutral impact		Significant positive impact
	Scientific excellence in decision-making (indirect)	Degree to which an action indirectly contributes to achieving the goal of scientific excellence in decision-making.	Significant negative impact		Neutral impact		Significant positive impact
Secondary considerations	Complexity of implementation	The complexity of implementation of the action with consideration of the level of coordination required across project partners.	Action requires coordination and collaboration with a wide range of partners to cover a wide variety of areas of expertise		Action requires coordination and collaboration with only a few project partners		Action requires no coordination with project partners
	Investment attractiveness	Assessment of attractiveness to external investors with consideration of scale, tangibility/measurability of outcomes, etc.	Action is highly unlikely to be attractive to external investors		Action is neither likely nor unlikely to be attractive to external investors		Action is highly likely to be attractive to external investors

Table 2 Weightings applied to each of the criteria in the MCA.

Category	Category weighting	Criteria	Criteria weighting
Cost	15%	Upfront cost	7.5%
		Ongoing cost	7.5%
Impact	70%	Resilient natural & unique ecosystem (direct)	8.8%
		Resilient natural & unique ecosystem (indirect)	8.8%
		Sustainable use, access, coastal living & livelihoods (direct)	8.8%
		Sustainable use, access, coastal living & livelihoods (indirect)	8.8%
		Community connection and stewardship (direct)	8.8%
		Community connection and stewardship (indirect)	8.8%
		Scientific excellence in decision-making (direct)	8.8%
		Scientific excellence in decision-making (indirect)	8.8%
Secondary considerations	15%	Feasibility/complexity	7.5%
		Investment attractiveness	7.5%
Total (check)	100%		100%

## D.6. TMBF RAC/MAC feedback on the MCA framework

Key TMBF committees (RAC and MAC) were given the opportunity to provide feedback on the MCA scoring and results (via a survey). Feedback on the MCA collected via the survey is summarised here, including notes on how each were addressed in the finalisation of the MCA:

- MCA criteria proposed are generally appropriate
- Strongest support for the following criteria, and the weightings for these criteria were adjusted (increased) to reflect these as being a higher priority for TMBF:
  - Direct impact to values
  - Scientific excellence
  - Complexity of the project
- While cost and investor attractiveness criteria were supported as criteria, their weightings were revised (lowered) to reduce the risk of only small low investment projects being deemed a priority, as TMBF don't want to avoid big complex projects if they have high impact.

## D.7. Results of the MCA scoring

The following graph (Figure D2) presents all 9 programs and their final weighted score.

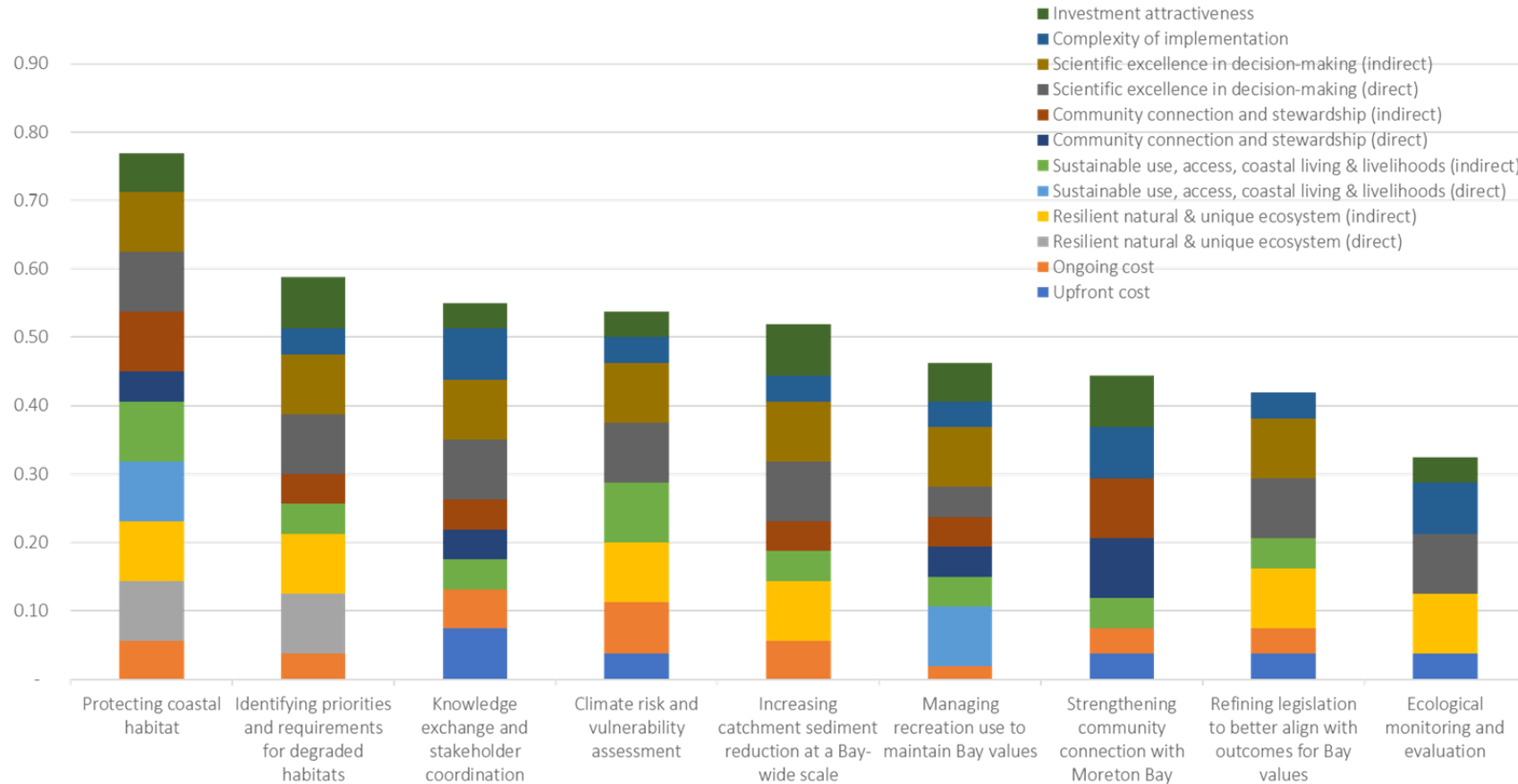


Figure D2. The 9 programs and their weighted scores, showing their ranking from highest to lowest. Bar colours represent the contribution of each criteria to the final score

## D.8. Sensitivity analysis

When undertaking an MCA, sensitivity testing forms a key component of the analysis. Given that there is a degree of subjectivity and uncertainty involved in the scoring and weighting it is important to determine whether changes to any key assumptions would affect the outcomes. A number of tests were undertaken in this case including:

- **Equal weightings across all criteria** – a test that reflects a case where no one criteria is more important than another. Note, that this scenario is not too dissimilar from the final set of weightings used.
- **Threshold test for cost criteria** – a test to determine how much the weightings on cost criteria would need to increase (at the expense of weighting on other criteria) to have a material impact on program rankings.
- **Threshold test for impact criteria** – a test to determine how much the weightings on impact criteria would need to increase (at the expense of weighting on other criteria) to have a material impact on program rankings.
- **Threshold test for secondary criteria** – a test to determine how much the weightings on impact criteria would need to increase (at the expense of weighting on other criteria) to have a material impact on program rankings.

Overall, the tests indicated that the high priority options identified through the MCA are robust to a range of possible weightings and significant changes to the set of weightings used would be required to materially change the priority actions.