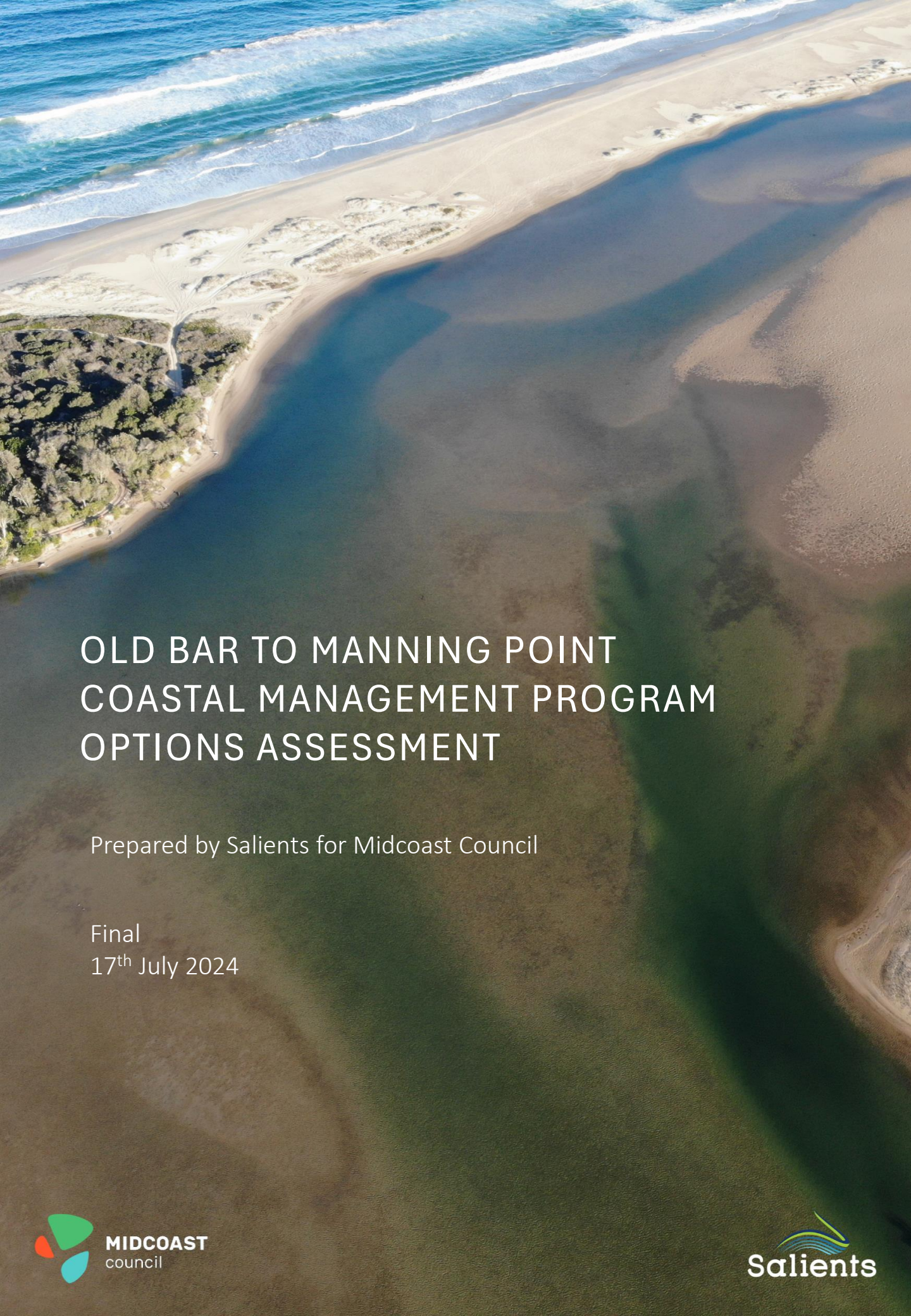

OLD BAR TO MANNING POINT COASTAL MANAGEMENT PROGRAM OPTIONS ASSESSMENT

Prepared by Salients for Midcoast Council

Final
17th July 2024

MIDCOAST council

Salients

OLD BAR TO MANNING POINT COASTAL MANAGEMENT PROGRAM OPTIONS ASSESSMENT

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Prepared For	MIDCOAST COUNCIL
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Executive Summary

This report, prepared by Salients Pty Ltd for MidCoast Council, evaluates coastal management options for the coast between Wallabi Point and Crowdy Head. The extent of the study area is shown in Figure E.1. The primary goal of the study was to assess previously identified management options to address ongoing and future coastal hazards, particularly in response to beach erosion, coastline recession and the impact of sea-level rise.

The purpose of this study is to support the development of the Old Bar Manning Point Coastal Management Program (CMP) as part of MidCoast Council's broader initiative to manage its entire open coastline under the *Coastal Management Act 2016* (CM Act).

The Coastal Management Manual (CMM), prepared to support the CM Act, outlines a 5-stage process for the preparation of a CMP. The study outlined in this report is part of Stage 3 (*Identify and evaluation options)*. The findings of this study will help Council to decide on the management actions which will be included in the final CMP, within the remainder of Stage 3, and Stage 4 (*Prepare, exhibit, finalise, certify and adopt the CMP*).

The methodology involved a comprehensive review of existing studies relating to:

- The underlying coastal processes, erosion, and alongshore sediment transport in the study area.
- Various management actions, their design and estimation of costs which have been proposed over the past 15 years to address erosion in the study area.

While details may vary between different studies, prior work clearly indicates that the beach in the study area is experiencing a net loss of sediment, leading to ongoing erosion and shoreline recession. This trend is expected to worsen with rising sea-levels. Hazard lines previously developed for Council indicate significant potential risks to the community by 2100 if appropriate planning and adaptation actions are not taken.

The management actions assessed, include "no regrets" options, physical interventions, and policy changes. Key “no regrets” recommendations include developing guidelines and planning controls, reviewing entrance management policies, and increasing community education and awareness.

A substantial proportion of management actions proposed in the past were clearly of a scale which could not be funded under the umbrella of a CMP, given the constrained funding environment in NSW. Options which had been previously assessed as having a cost exceeding $20M AUD were not considered further. The CM Act is clear that actions which do not have an identified, viable funding mechanism should not be included in a CMP.

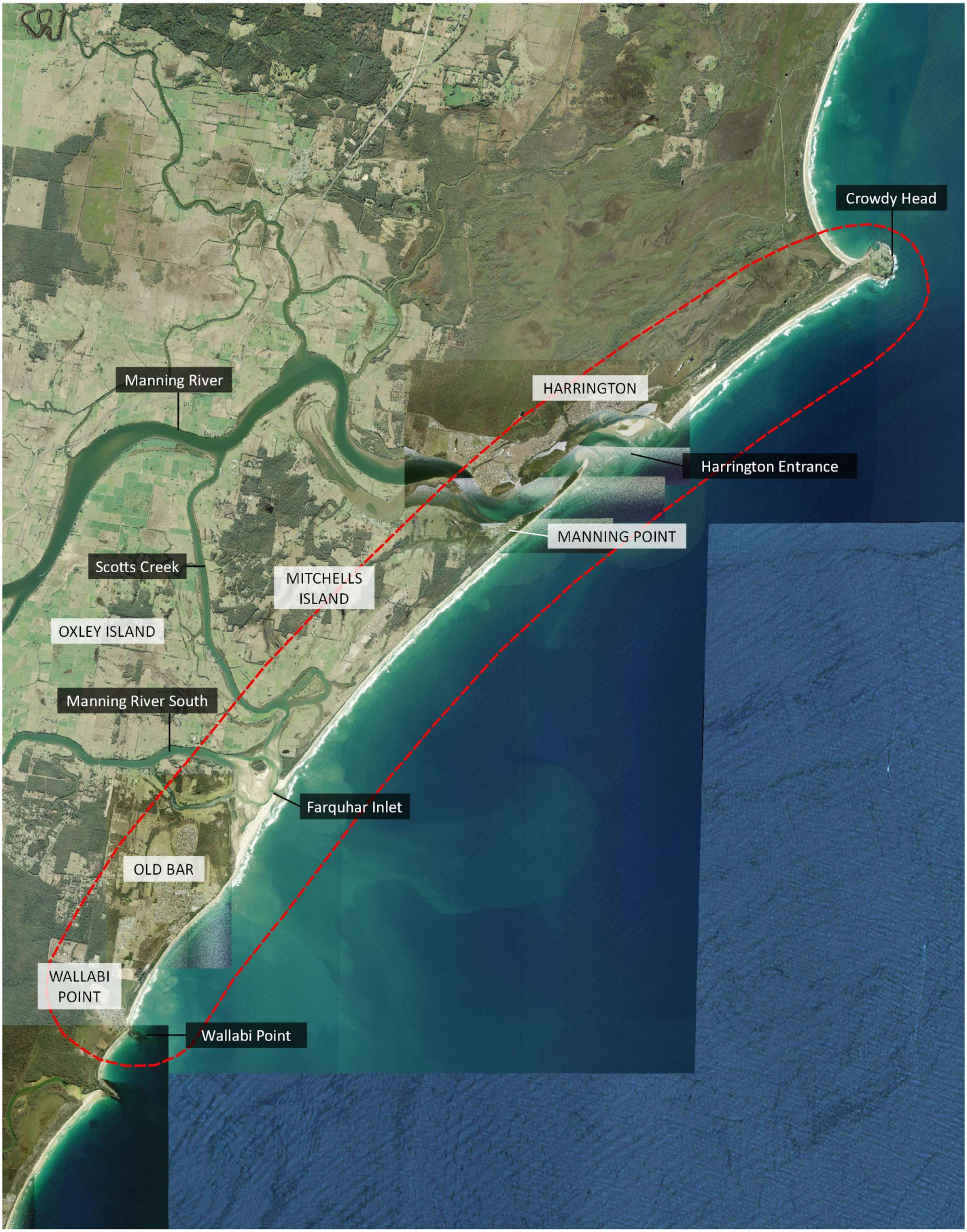

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Figure E.1 Study Area – Old Bar to Manning Point

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Old Bar Manning Point CMP Options Assessment

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The remaining management options, included a variety of protective works and interventions or actions with a range of potential positive and negative outcomes. These remaining actions were the subject of a Multi Criteria Analysis workshop held on 21st May, 2024.

The criteria used for scoring the management options were developed from several sources, including the outcomes of community consultation completed by Council and the consulting team. The consultation completed and outcomes of the process are reported in Appendix C. Consistent with the methodology recommended in the CMM, criteria were grouped into the following categories:

- **Feasibility:** Can the action be reasonably undertaken?
- **Acceptability:** Is the action likely to be acceptable to the immediate and broader MidCoast community?
- **Fairness:** Does the intervention impose unreasonable obligations on the immediate and broader community and future generations?

The MCA workshop was attended by 15 community members recruited from an open, expression of interest request. Furthermore, representatives from DCCEEW, NPWS, Crown Lands, Coastcare, the Local Aboriginal Land Council, and the Old Bar Manning Point Business and Community Association attended and participated in the scoring.

Actions were grouped into two geographical areas:

1 Old Bar.

2 Farquhar Inlet, Mitchells Island and Manning Point.

Through a two-stage scoring and averaging process, raw MCA scores were generated and averaged across participants. These were then "normalised" so that the best scoring option in each geographical area was scaled to have a value of 100, and other options scaled accordingly.

At the MCA workshop, attendees were specifically instructed to not consider cost. Instead, prior reports were examined to extract past cost estimates for the different management actions and the assumptions underpinning those cost estimates. Those estimates were then brought up to date considering inflation and, where relevant, updating the cost rates for different types of work to reflect the state of the construction market at present. In this way, the cost estimates were upgraded so that the cost of different options were directly comparable.

The key findings of the assessment process, including the normalised MCA score, the rank from the MCA exercise, and the cost estimate projected forwards to the end of 2025 are presented in Table E.1 (Old Bar) and Table E.2 (Farquhar Inlet, Mitchell's Island and Manning Point), respectively.

Table E.1 Old Bar Management Option Assessment Summary

Option	MCA Normalised Score (all participants, all criteria)	MCA Rank per site (all participants, all criteria)	Cost ($Million AUD)	Comment
Old Bar Lewis St Rock Revetment	9	6	12.5	Robust, engineered solution but still likely to eventually lose beach. May only work for ~30 years. Still probably requires sand import to repair end effects. Expect 2 to 3% of capital cost for maintenance p.a.
Old Bar Pacific Parade Rock Revetment	13	5	10.6	Robust, engineered solution but still likely to eventually lose beach. May only work for ~30 years. Still probably requires sand import to repair end effects. Expect 2 to 3% of capital cost for maintenance p.a.
Old Bar Submerged Breakwater / Multipurpose Reef	-20	8	26.0	Earlier cost estimates were likely low, expect 3 to 5% of capital cost for maintenance p.a.
Old Bar GSC Container Wall	18	4	8.63	Lower Cost than full revetment, (includes both Lewis and Pacific Parade), but may only last for 10-15 years. Lewis St could be protected first at reduced cost.
Old Bar Rock Filled Bag Revetment	-8	7	17.2	More moderate cost than full rock revetment, but limited experience with these units in surf zone in Australia and care would be needed.
Old Bar – Property Purchase	44	2	90.0	Difficult to ascertain, but this is the full estimated purchase price of beachfront residential property in Old Bar at present.
Old Bar – Beach Scraping	33	3	0.15/year	Is a short term, stop gap measure for beach repair, won't solve long term chronic issues.
Old Bar Flexible Adaptation (including managed retreat)	100	1	0.1/year for 5 years	Internal council staff effort, likely worth around the same amount is needed in addition (0.8-1.0 FTE). Best practice strategic approach but doesn't include any implementation. This may also be considered for Manning Point, but Old Bar is a priority.

Many of the options that have gained attention over the past 15 years are big ticket items which will not provide a definite, long-term (say > 50 years) solution. The clear recommendation to be drawn from the assessment is that management options which involve soft options, flexible adaptation and eventual retreat from the sites which are most threatened by coastal recession should be followed.

Implementation would typically involve the development of Local Adaptation Plans (LAPs). In following international best practice, the local community should have a lead role in the form that those local adaptation plans will take. It is important to not

give the community false hopes regarding the long-term effectiveness of any engineered protective options within this coastal compartment or the likelihood that funding will be made available.

Table E.2 Farquhar Inlet, Mitchell's Island and Manning Point Management Option Assessment Summary

Option	MCA Normalised Score (all participants, all criteria)	MCA Rank per site (all participants, all criteria)	Cost ($Million AUD)	Comment
Farquhar Inlet – Dredging to keep entrance open.	9	3	2.25, then 1.6/yr	Estimated $32-33M AUD over 20 years.
Farquhar Inlet – dredging and training structures	-51	4	>40	Based on original analysis from 2010, costs were much lower, but likely to result in ineffective structure. Very expensive.
Farquhar Inlet – Dredge to form Lake behind Berm	-137	5	8.8	Reasons/Justification for option seem very unclear.
Mitchell's Island – Soft options	70	2	45 (nourishment) 0.21/yr (scraping)	Effective nourishment requires extensive placement of sand. Mechanism for this to happen and immature market in NSW makes it extraordinarily expensive. Scraping may be considered initially, but is only a short-term solution, sometimes very short.
Manning Point – Soft options	100	1	80 (Nourishment) 0.36/yr (scraping) 0.22/yr (dune rehabilitation)	Nourishment includes that for Mitchell Island as well (row above), subject to same limitations. Options could be combined as a suite as part of local adaptation planning for Manning Point.

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1 Introduction

1.1 Background

MidCoast Council (Council) intends to prepare a Coastal Management Program (CMP) for the entirety of its open coastline, in accordance with the *Coastal Management Act 2016* (CM Act). The Old Bar Manning Point (OBMP) CMP is part of that larger project and will eventually be integrated into the future Open Coast CMP. Due to ongoing, critical concerns along the coast between Wallabi Point and Crowdy Head, Council is advancing the OBMP CMP ahead of the broader project.

This study sits within "Stage 3" of the idealised process for the development of CMPs recommended by the current Coastal Management Manual (NSW Government, 2018a). Stage 3 includes the identification and assessment of management options.

Several studies have been completed over the last decade to understand the coastal processes occurring between Wallabi Point and Crowdy Head, and to develop potential management actions that could address any key issues.

To inform the present study, Council compiled a list of management actions identified from those studies. This report has consolidated and assessed those management actions based on historical investigations and existing data. No further data collection or modelling has been conducted to address coastal processes at the shoreline or to predict future hazards.

This CMP process emphasises the need for informed decision-making to address coastal challenges in the region. Importantly, it looks to assist in planning to minimise future coastal hazard impacts on the shoreline, development, and infrastructure. The aim of the process is to arrive at a clearly defined, realistic and adaptable set of solutions that may be implemented as and when required.

1.2 Site Description

The study area extends from the Wallabi Point Headland to Crowdy Head, around 25km along the coast and around 2km inland. The study area is shown in Figure 1. It includes the township of Wallabi Point, located landward of the southern headland. The largest town of Old Bar is 3km further north, with a beach frontage stretching over 1.5km either side of the Racecourse Creek entrance.

The southern entrance to the Manning River (Farquhar Inlet) is located approximately 6km from the southern boundary of the study area at the junction of the Manning River South Channel and Scotts Creek. This entrance is part of the complex delta system which forms the lower part of the Manning River. The entrance intermittently opens, and the entrance location migrates over approximately 1.5km in response to both natural and managed river openings. Once opened and following periods of lower

flows and alongshore sand transport under waves, the inlet shoals reform, tidal flows are choked, and the entrance closes.

Scotts Creek and the Manning River South Channel define the hinterland between the south channel and the main channel at Harrington into two islands, with Oxley Island immediately landward of Farquhar Inlet and Mitchells Island stretching north, from Scotts Creek to the Manning River entrance at Harrington.

Mitchells Island comprises low-lying rural land with limited foreshore development, except the small township of Manning Point, around 2 to 2.5 km south of the Harrington (northern) entrance of the Manning River. The small town is adjacent to the river but there is only a narrow dune buffer separating it from the beachfront to the east. There is potential for the sand spit to be breached at several locations south of the present Harrington entrance, should current projections for beach recession and ongoing sea-level rise be realised. Sections of the Manning Point spit are between 50m to 200m wide.

The area of interest for this assessment extends approximately 2km inland and encompasses the active nearshore ocean margin. A depth of 20m is approximately the offshore limit of the significantly active beach profile. This differs from the definition of the *beach fluctuation zone* from the CM Act which extends to a limit of 40m, which is more representative the maximum extent where any measurable change in the beach profile could be expected.

Within the active beach profile, sand transport occurs alongshore and onshore under typical wind and wave action. Significant volumes of sand can also be carried offshore during storms. This can cause erosion which would typically extend to the back of the subaerial beach, often defined by the dune crest.

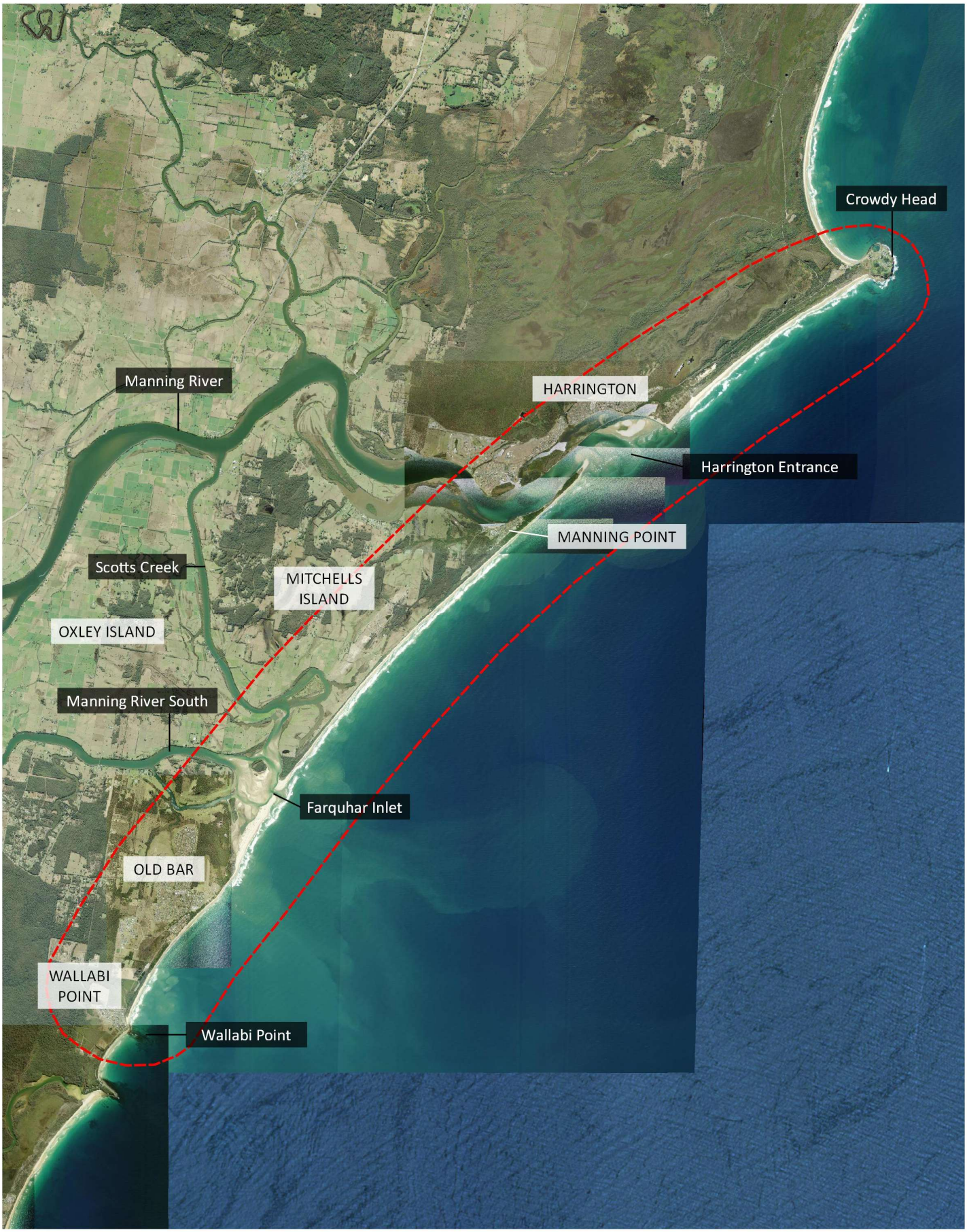

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Figure 1 Study Area – Old Bar to Manning Point

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Old Bar Manning Point CMP Options Assessment

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2 Coastal Processes

2.1 Overview

The study area is located within the Crowdy-Black Heads sediment compartment and comprises almost the entire length of that compartment. This compartment stretches from Black Head (southern end) to Crowdy Head (northern) and is categorised as a secondary level compartment according to the classification system described in Short and Thom (2018) and listed in Schedule 1 of the *Coastal Management Act 2016* (CM Act). Within this broader compartment, BMT (2020a) reports several tertiary level compartments, which are more localised, beach-scale areas. These include:

- Old Bar beach, from Wallabi Point to Urana Bombora (Northern end of Old Bar)
- Farquhar Inlet
- Mitchells Island to Manning Point.

The sediment compartment is in "sediment deficit", meaning that the amount of sand transported out of the compartment exceeds what is being transported in. As a result, coastal erosion and shoreline recession are ongoing issues, and will be exacerbated, in future, by ongoing sea-level rise and any increase in storm intensity which may arise from climate change. No long-term sand sources that could naturally reverse this trend have been identified.

2.2 Open Coast

The sediment movement and long-term beach stability in the study area are complex, with long sections of sandy embayment stretching between isolated headlands that have offshore reef extensions affecting the rate and frequency of alongshore sand movement and sand bypassing (Wallabi Point, Old Bar). Some isolated submerged reefs have been identified offshore and these affect the wave energy at various locations along the coast, depending on wave period and approach direction.

Review of the available geomorphological information suggests a general (net) sand movement from south to north through the study area. Much of the beach is underlain with old coastal or estuarine deposits which are exposed from time to time as the beach recedes. These include indurated sands (or coffee rock) which are relict deposits formed behind dune systems at the water table as old sand deposits are cemented.

Coffee rock formation predates the current period of sea-level rise, and its exposure suggests that the beach is at its furthest landward location since the mid Holocene High Stand approximately 6,000 to 4,000 years ago. In terms of its resistance to erosion or recession of the beach, BMT (2020a) advised that testing:

> *"showed that the strength of the indurated sediments reduced rapidly upon simulated weathering of the materials. This process may take longer than for typical beach sands, but the exact delay in effect is unknown and in the context of cumulative erosive effects (long-term recession) it can be considered similar to sandy substrate.".*

Over the past 40 years, multiple studies including wave modelling, sand tracing and analysis of the historical records (survey and aerial photography) have been completed. While there are differences in the quantification of alongshore sand transport rates, storm erosion rates, and potential long-term beach recession under sea-level rise, such discrepancies are primarily due to the differing underlying assumptions used in the analyses.

Sediment movement under waves and currents may, from time to time, reverse from the typical south-to-north direction to be dominated by a north-to-south movement for some time. However, there is still a consensus that the net transport is northerly through the study area. This is reflected in the shape of the various beach embayments with greater curvature of the beaches immediately north of prominent rock headlands, and a straighter alignment approaching headlands from the south. This is consistent with the general understanding of coastal processes on the NSW coast and reflects the coast generally aligning between "hard points" over time, due to the dominant southeast wave climate.

The headlands and adjoining reefs do not act as complete barriers to sand movement to the north but are considered "leaky" barriers. This means that sand can move around or through the headland (and associated offshore reefs) if suitable conditions of sand availability and wave direction/energy are met. Significant sand movement from north to south around these headlands would be rare.

Following a beach erosion event caused by a storm, and given sufficient suitable wave conditions, the beach will start to recover. As the waves slowly move the sand deposited offshore from the surf zone and carry it to the shoreline, nearshore shoals re-establish, and the beach rebuilds.

The most recent and detailed assessment of the coastal processes through the study area was undertaken during development of the Strategic Business Case (SBC) for the Manning River Entrance Project, prepared by the Maritime Infrastructure Delivery Office (2022). The coastal processes assessment completed for the SBC was completed by Bluecoast (2021). That underpinning report was not available for our use in this assessment, although a summary is provided in Maritime Infrastructure Delivery Office (2022). The sediment budget derived from that work is presented in Figure 2.

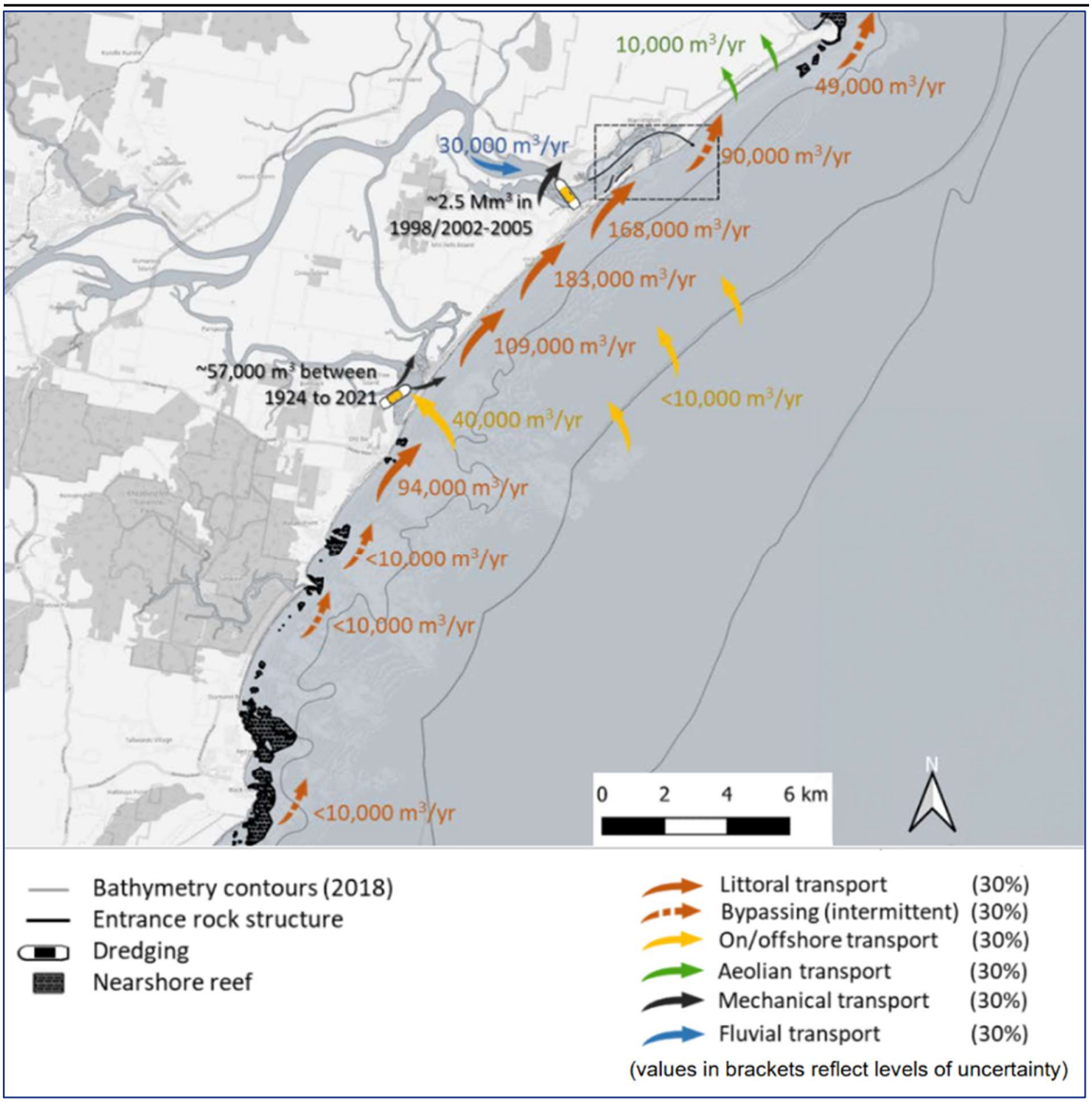

Figure 2 Quantified conceptual model of sediment transport through the study area (after Bluecoast (2021), adapted from NSW Maritime Infrastructure Delivery Office (2022))

2.3 Manning River Entrances

A further complication is the interaction of the beach with the Manning River system. The river is not believed to be a significant present day net supplier of sand to the open coast under present-day conditions. It does however provide a temporary source and sink for alongshore sand movement into and out of the river entrance at Harrington and intermittently at Farquhar Inlet.

At Farquhar Inlet, when there is a flood in the river behind the closed entrance and water levels rise high enough to overtop the sand barrier, an exit channel is scoured, and substantial volumes of the sand contained within the shoals inside the entrance

are deposited in the nearshore area of the adjacent coast. This results in a significant transfer of sand to the coast from those shoals as they are scoured. Coastal storms and flood events often occur at similar times and the nearshore deposits may be quickly redistributed along the shoreline, typically to the north and occasionally to the south, but in either case nourishing the beaches along the open coast.

Following flooding, waves work to carry sand into the entrance, building a bar. Eventually, tidal flows are choked by the ingress of sand and the ongoing tide flows are insufficient to keep scouring an entrance channel. The entrance closes and the barrier builds through ongoing wave activity and sand being blown onshore from the bare barrier. The natural frequency of entrance opening and closing depends on the magnitude and frequency of storms and floods. The entrance may remain open for extended periods (months to years) or may close shortly after opening (weeks to months).

While dredging from Farquhar Inlet may be seen as a source of sand for nourishing the beach system on the open coast, it does not provide a reliable sand source, as no additional sand is being imported to the active beach system. Sand artificially removed from the estuary will be replaced as the shoals again grow inside the estuary through repeated opening and closing activity. That replacement sand will ultimately come from the open coast.

As sea-level rises it is likely that these estuary shoals will continue to infill but at progressively higher levels, commensurate with the amount of sea-level rise which occurs along the NSW coast. That demand for additional sand inside Farquhar Inlet result in a net loss of sand along the open coast beaches over time.

The Maritime Infrastructure Delivery Office (2022) advised that, based on studies undertaken, during the period 1999 to 2018, the shoals in the lower Farquhar entrance accreted by approximately 775,000 m^3 or a rate of 41,000m^3/yr. Any future works proposed to manage Farquhar Inlet entrance behaviour must take this impact into account. Changes to the entrance (natural or artificial) as sea-levels rise will also impact this interaction between the river and the beaches.

At Harrington, the tidal exchanges from the river are sufficient to maintain a persistent channel through the shoals and the entrance remains open in its current configuration. The lower estuary and entrance shoals act as a large temporary source and sink for sand moving under wave action along the coast with The Maritime Infrastructure Delivery Office (MIDO 2022 see Figure 2) advising:

> *"The net sediment transport is in a northerly direction with around 71,000 cubic metres or more of sand being transported into Harrington inlet annually."*

Significant entrance works have been undertaken and further potential works have been recently considered but are not within the scope of this assessment. MIDO (2022)

noted that Manning Point Spit south of the entrance is approximately 50 metres wide and there is a risk of it breaking through, endangering the town of Manning Point.

To complicate the matter further, there is an interaction between the two entrances that is not completely understood. When the Farquhar entrance is open this reduces the flows through the North Channel at Harrington. While this impact itself is minor. It may affect the temporary sand supply scouring from the shoals at both entrances, depending on the frequency of opening at Farquhar and the incident wave climate.

Should any further training works or dredging programs be undertaken to maintain either the Farquhar or Manning Point entrances (for flood reduction, water quality or navigation) then this has the potential to disrupt the existing exchange of sand between the estuary and the adjacent beaches. Training works can improve the conveyance of the channel, resulting in long term changes to the system. Potentially, an increase in efficiency of the entrance can result in net scouring of the entrance shoals, with an increase in the tidal ranges in the estuary as tidal exchange increases and the shoals are permanently altered. Such processes can continue slowly over decades as the system adjusts and so any entrance works should be cautiously approached. These impacts are most likely to occur due to major entrance training works, such as those considered at Harrington. The process is beyond the scope of the present assessment.

2.4 Presence of Rock

Recent assessment of onshore bedrock and re-assessment of the probabilistic hazard lines through the area was completed by BMT (2020a) to determine locations of nearshore bedrock at the shoreline and to reassess previous hazard mapping to allow for the impact of bedrock as and when exposed. BMT divided their classification into four categories:

- Erosion limiting substrate – bedrock landforms that would resist all erosion.
- Erosion influencing substrate – bedrock landforms that influence adjacent erosion patterns, such as offshore rocks that shelter sections of the beach from wave impacts.
- Erosion resisting substrate – indurated sediments (e.g. coffee rock) that may provide partial resistance to short-term erosion, but will generally yield under long-term weathering, erosion, and shoreline recession; and
- Erodible substrate – unconsolidated (generally sandy) sediments that are readily mobile and are easily eroded and transported.

The study identified and mapped substantial areas of onshore erosion limiting substrate at Wallabi Point and at Old Bar with extensive areas of exposed rock reef

extending several kilometres offshore at both locations. The onshore substrate extents from BMT (2020a) are shown in Figure 3.

2.5 Hazard Definition

The updated, detailed modelling study to define the extent of the erosion hazards was undertaken by BMT (2020a) and has provided a set of probabilistic maps showing the location of the future hazard lines for various times and covering the entire assessment area with a range of likelihoods (1%, 10%, 50%). In their discussion of the assessment BMT (2020a) advised that:

> *"This study has provided an updated set of erosion hazard lines based on the best understanding of regional sediment transport processes available in the literature."*

The 2100 1% exceedance probability extents are shown for the entire study area in Figure 3.

BMT's analysis highlights the extent of the issues that may arise by 2100 should no management actions be taken. Underlying assumptions used in the modelling and input data are clearly stated in the study report. The assessment incorporated the future impacts of underlying bedrock as determined in the geological assessment and existing surface mapping. BMT adopted conservative assumptions where decisions needed to be made around certain variables.

When viewed in isolation the hazard lines show the potential do nothing management option, allowing the beach to respond to the existing entrance configurations and alongshore sand transport rates, but without erosion intervention. Any works proposed on the open coast or within the Farquhar and Manning Point estuaries, will potentially impact the likelihood of these hazard lines behaving as assessed in BMTs analysis.

2.6 Sea-level rise

BMT's hazard lines incorporated the effects of sea-level rise. The **IPCC** (Oppenheimer et al., 2019) has stated that:

> *"Risk related to SLR (including erosion, flooding and salinisation) is expected to significantly increase by the end of this century along all low-lying coasts in the absence of major additional adaptation efforts (very high confidence)".*

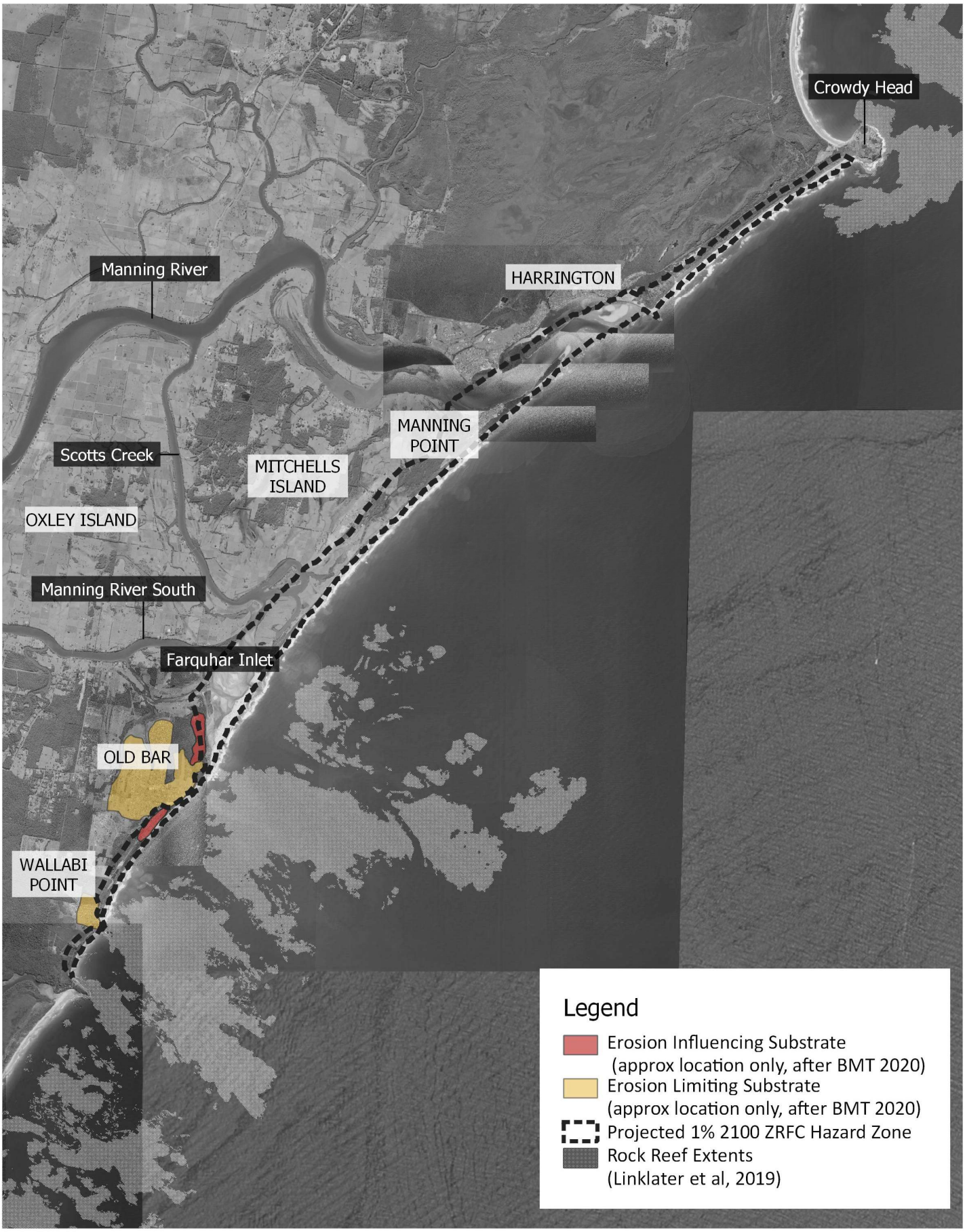

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Figure 3 Coastal Geology and Hazard Extents of the Study Area

Old Bar to Manning Point Options Assessment

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And further cautions (p.328) that:

> *"Rising mean and increasingly extreme sea-level threaten coastal zones through a range of coastal hazards including (i) the permanent submergence of land by higher mean sea-levels or mean high tides; (ii) more frequent or intense coastal flooding; (iii) enhanced coastal erosion; (iv) loss and change of coastal ecosystems; (v) salinisation of soils, ground and surface water; and (vi) impeded drainage. At the century scale and without adaptation, the vast majority of low-lying islands, coasts and communities face substantial risk from these coastal hazards, whether they are urban or rural, continental or island, at any latitude, and irrespective of their level of development (Section 4.3.4; Figure 4.3; high confidence)."*

More recently the IPCC (2021) in their Summary for Policymakers (Section B.5.3) warned that higher potential rates of sea-level rise could eventuate:

> *"Global mean sea-level rise above the likely range – approaching 2 m by 2100 and 5 m by 2150 under a very high GHG emissions scenario (SSP5-8.5) (low confidence) – cannot be ruled out due to deep uncertainty in ice-sheet processes".*

More recently Cozannet et al. (2023) noted:

> *"Sea-level rise will fundamentally change coastal zones worldwide (Cooley et al 2022). A global two meters rise of sea-level will be exceeded sooner or later within a time window ranging from one century to as long as two millennia, depending on future greenhouse gas emissions and polar ice-sheet melting (Fox-Kemper et al 2021). Here, we show that in addition to climate mitigation to slow this rise, adaptation to two meters of sea-level rise should start now. This involves changing our mindset to define a strategic vision for these threatened coastal areas and identify realistic pathways to achieve this vision. This can reduce damages, losses, and lock-ins in the future, identify problems before they become critical and exploit opportunities if they emerge. To meet this challenge, it is essential that coastal adaptation becomes core to coastal development, especially for long-lived critical infrastructure. Coastal adaptation will be an ongoing process for many decades and centuries, requiring the support of climate services, which make the links between science, policy, and adaptation practice."*

There is now certainty that climate change already built into the system will ensure oceans continue to rise beyond 2100 and will exceed 2 metres in total. The question is when, not if. Cozannet et al. (2023) conclude by stating:

> *"To respond to the almost inevitable exceedance of 2 m of sea-level rise, three actions are urgently needed: (1) massive and immediate reduction of greenhouse gas emissions, to slow down sea-level rise, limit the amplitude of sea-level rise in the long term and give more time to adapt; (2) stronger engagement with adaptation to multi-meters of sea-level rise, focusing on long-living and high-value assets and on measures with immediate co-benefits; and (3) develop science*

and climate services to anticipate early signs of acceleration of sea-level rise, assess risks and adaptation options and provide actionable information to coastal adaptation practitioners". And that: "The climate is warming quickly. Sea-level rise is accelerating and coastal adaptation takes time. We need to think strategically; what is our vision for the different coastal and estuarine areas around the world over the decades and centuries to come?"

2.7 Key Points of this Assessment

The following are the main points that need to be considered in evaluating potential options:

- The study area assessed between Wallabi Point and Manning Point is sediment deficient with (on average) less sand moving into the compartment around Wallabi Point than is leaving the compartment to the north at Manning Point.
- The foreshore throughout the areas assessed is receding due to this sediment imbalance. This recessionary trend will be significantly impacted as sea-level rises at an increasing rate.
- While there may be a minor onshore sand supply under certain wave conditions, this is minimal. The offshore seabed is largely comprised of a thin layer of sediment overlying gravels, clay, and bedrock. There are large, exposed areas of bedrock reef off Wallabi Point and Old Bar. No sand sources to nourish the beach have been identified nearby.
- The Farquhar Inlet and Harrington Entrances act from time to time as sources and sinks for sediment moving alongshore. During flood periods both entrances scour and shoals inside the entrances may also be eroded and deposited outside the entrance, providing an intermittent sand supply to the alongshore sand movement (predominantly to the north). During fair weather, the sand can move back onshore and once the sand supply from the south reappears the shoals inside the entrances rebuild, again acting as a temporary sink for alongshore sand movement (predominantly from the south).
- The back beach area is generally low lying and while some bedrock exists, and has been mapped, the back beach area largely comprises erodible Pleistocene age beach and estuarine deposits.
- Indurated sand is exposed at the back of the beach at several locations throughout the study area (Wallabi Point, Old Bar, Farquhar Inlet and Manning Point), indicating the beach is at present as far landward as it has been during the past 6,000 years since sea-level stabilised around the present level.

- While the analysis undertaken has considered potential beach change to 2100, current scientific advice states that sea-level will most likely continue to rise for several centuries due to the heat already absorbed in the ocean and irrespective of Greenhouse gas emission levels. At least 2m of sea-level rise is now considered to be inevitable, although the timeframe over which this occurs remains uncertain.
- Existing development and infrastructure along the coast are already at risk and properties have been lost.

3 Management Options and Assessment

3.1 Background

A total of 73 previously identified management options were extracted from a range of sources. For this study, a final list was compiled from two key documents prepared by Council:

- Old Bar Manning Point Coastal Management Plan Issues and Management Options Discussion Paper (Mid Coast Council, 2023), which outlines management issues and options identified by previous studies, community consultation, the Project Control Group, Community Reference Group, and internal consultation.
- In addition, Council compiled a table of management options from several previous studies:
    - Coastal Erosion: An Elegantly Simple Solution at Harrington (Calvin, 2023).
    - The Manning River Entrance Project Strategic Business Case (Maritime Infrastructure Delivery Office, 2022).
    - Report of the Manning River Taskforce (NSW State Government, 2020a).
    - Racecourse Creek Flood Study and Options Assessment (NSW State Government, 2020b).
    - Coastal Scoping Study (Mid Coast Council, 2020).
    - Old Bar to Manning Point Coastal Erosion and Hazard Mapping Update (BMT, 2020a).
    - Manning River Floodplain Risk Management Study and Plan (BMT, 2020b).
    - Manning Point Beach Nourishment (Mid Coast Council, 2019).
    - Manning River Southern Breakwater Feasibility Study (NSW State Government, 2018).
    - Old Bar Beach Scraping Feasibility Discussion (NSW State Government, 2017).
    - Erosion Analysis of the Manning Valley Coastal Sediment Compartment (Manly Hydraulics Laboratory, 2017).
    - Old Bar Beach Sediment Tracing (Royal Haskoning DHV, 2016).
    - Cost-Benefit Analysis of Options to Protect Old Bar from Coastal Erosion (The Balmoral Group, 2014).

- Old Bar Beach Coastal Protection Structure Design Investigation (Royal Haskoning DHV, 2013).
- A Review of Artificial Reefs for Coastal Protection in NSW (Blacka et al., 2013)
- Greater Taree Coastline Management Study (Worley Parsons, 2010a).
- Farquhar Inlet, Old Bar Entrance Opening Management Plan (Worley Parsons, 2010b).

For this study, those management options have been consolidated and duplicates removed. The remaining actions have been categorised. The overall process is outlined in the following sections. Noting that the focus of the present study is to undertake multi-criteria analysis on various management actions, the consolidation aimed to remove actions as follows:

- "No Regrets" options, which will provide benefit for moderate cost, regardless of any uncertainties that surround coastal management and future sea-level rise. Actions typically include the development of policies and strategies, and the completion of relatively inexpensive studies to support policy and strategy decisions. Brief summaries are presented in Section 3.2. and these options should pass directly into the CMP following prioritisation and as the annual budgets and Council's internal capacity for implementation allows.
- Infeasible options which, from the outset are beyond the capacity of present funding sources and typical arrangements within a CMP managed by MidCoast Council. A coarse filter using a maximum previously assessed capital cost of $20 million was applied to actions based on experience of the authors with several CMP's that have either recently been gazetted or are at the stage of public exhibition. At that stage the inclusion or otherwise of management actions has been negotiated between stakeholders. It is possible that some of these 'big ticket' items could be included in the CMP, if a state government agency or other stakeholder wishes to take responsibility for the action in full. However, Council's budget will not extend to cover such expensive actions, even considering the ability to leverage funds through available grants programs.

Furthermore, several actions were identified as being duplicates of other options. This included different options which varied only marginally. The main filtering of actions is tabulated in Appendix D. The reasons for identifying management options as infeasible are outlined in Appendix E.

3.2 No Regrets Options

The following options have largely been based on descriptions of proposed actions provided by Council in a draft issues and management options paper (Mid Coast Council, 2023).

3.2.1 Develop guidelines and planning controls to minimise risk

MidCoast Council has not specifically articulated its policy position in relation to how it intends to approach coastal adaption along this length of coastline. Regardless of the management actions eventually adopted in the CMP, it is essential that Council formalises its policy position to provide clarity and guide any future works or adaptation plans.

Following from policy development, guidelines can be developed to clearly state how the treatment of different land-use scenarios should be practically realised. This is essential to ensure consistent decision making and to provide transparency to landowners and the wider community.

3.2.2 Review entrance management policy and procedures – Farquhar Inlet

MidCoast Council's existing Entrance Opening Management Plan is dated (Worley Parsons, 2010b). Since that time there have been substantial developments in the understanding and guidance available for entrance management. For example, the threat and risk assessment completed for the Marine Estate Management Strategy (BMT WBM, 2017) identified *Estuary Entrance Modifications* as the second most significant threat to environmental assets within the marine estate.

While not strictly an ICOLL (Intermittently Closed and Open Lake or Lagoon), the waterbody behind the Farquhar Entrance exhibits a similar bipolar (open or closed) behaviour, with natural variations of water quality and ecology following. Policy and guidance documentation, strictly applicable to ICOLLs (Department of Primary Industries, 2013; Ferguson et al., 2020), but post-dating the current Entrance Opening Management Plan should be considered as part of a review of the policy and procedures for entrance management.

3.2.3 Community education and awareness

Increasing the community's awareness of coastal processes is important to build understanding and resilience. Acute coastal erosion events can place people and property at risk. Like bushfire and flooding, encouraging community preparedness is important. Council and the SES have opportunities to educate and encourage communities to anticipate and prepare for storm seasons.

There are opportunities to provide educational information about a range of ecological, cultural, and geomorphologic aspects of the coast.

A coastal signage strategy should aim to provide consistent and complementary signage across the MidCoast LGA. The strategy should anticipate rationalising existing signage and minimising educational signage using alternative solutions such as QR codes. This needs to be undertaken in a manner that does not detract from the natural qualities of the coastline by adding overly to visual pollution.

Emergency signage should be consistent, easily interpreted and appropriately located.

The management activities could include providing information through social media channels and Council's website, targeted media, and mail outs in the lead up to storm season and the development and implementation of a coastal signage strategy.

3.2.4 Amendments to RH SEPP, LEP and DCP

A key outcome of the CMP will be to install both statutory and non-statutory planning controls. There are two avenues for statutory controls:

- *State Environmental Planning Policy (Resilience and Hazards) 2021* (RH SEPP)
- Council's Local Environment Plan (LEP)

Non-statutory planning controls would be implemented via a revision of Council's Development Control Plan (DCP) regulations to include guidance for development within areas vulnerable to coastal processes.

Council is currently preparing the draft MidCoast Local Environmental Plan which will replace the three existing Local Environmental Plans that operate in the MidCoast. The Great Lakes LEP includes a local clause (c7.4) relating to coastal risk planning. It is proposed to include a similar clause within the MidCoast LEP. The clause requires that development within the coastal planning area demonstrate compliance against specific standards. An alternative, or additional, approach is to map the areas as 'coastal vulnerability areas' in the SEPP.

The DCP has an important role for the interpretation and application of the statutory clause in either the SEPP or the LEP. An existing DCP for coastal hazards exists in the Great Lakes DCP and Greater Taree DCP. A similar, albeit revised DCP would be required to support the statutory clause. Following the preparation of the MidCoast LEP, Council will commence the DCP.

A section 10.7 Planning Certificate is a legal document that Councils are required to provide to inform potential buyers, developers and property owners about planning controls and other factors that may affect their property. These are a very important means to notify prospective purchasers of issues on a property such as vulnerability to coastal processes.

Council has a robust s10.7 planning certificate process that meets the requirements of the *Environmental Planning and Assessment Act 1979* and associated Regulation. Mapping of coastal hazards relies on:

- Great Lakes LEP – Coastal Risk Planning mapping
- Greater Taree DCP2010 – Coastal Risk Hazard line

Advice on these is provided on s10.7(2) and 10.7(5) certificates issued by Council.

The probabilistic hazard modelling has provided updated coastal hazard risk data. A planning proposal is required to update the SEPP and/or LEP mapping which would then be used to inform the s10.7 certificate hazard notification. Once Council resolves to proceed with this amendment, certificates will need to state that the land is subject to a draft LEP amendment.

3.2.5 Aboriginal Cultural Heritage Assessment and Adaptation Study

There are many Aboriginal cultural heritage sites in proximity of the coast. As the coastline continues to recede and is subject to acute coastal erosion events, there is the high risk that these sites will be exposed and damaged.

A cultural heritage impact assessment and adaption study is proposed to determine the cultural heritage assets at risk and to empower the local Aboriginal Community to respond in culturally appropriate way. It is likely that exposure or damage to known items will occur during an acute event. It is also likely that unknown items will be exposed during these events. The proposed study should include clear protocols and responsibilities in such an event.

3.2.6 Community facilities and public spaces audit and asset management plan

There are numerous public recreation assets in the study area that will be subject to coastal processes, including Mudbishops Reserve, Vic Shoesmith Reserve and Farquhar Park. Plans of management exist for these parks and reserves and plans are reviewed on a regular basis.

Many of the public spaces including beaches have shared or unclear management responsibilities. There needs to be a clear and coordinated approach to the management of those areas.

This action proposes an audit of community assets and facilities at risk from coastal processes, including determination of ownership/tenure where possible, and then the development of an Asset Management Plan to respond to those risks. The individual plans of management for reserves would then be revised, consistent with the Asset

Management Plan, and to ensure that coordinated management is encouraged with relevant agencies.

3.2.7 Transport asset management plan

There are many areas where roads, car parks, associated drainage, footpaths, and cycleways are vulnerable to damage or destruction due to coastal processes. An audit of these assets is proposed to determine the nature of immediate, short-, medium- and long- term risks.

In some locations there is a public road between the current coastline and private properties or public land. Damage to those roads will occur over time to a point where they are no longer safe or functional. A clear policy outlining the 'buying time' works and adaption pathways that are acceptable needs to be articulated. That policy may be addressed as part of the action described under Section 3.2.1 For example, a 2-way street may be converted into a 1-way system when part of the road is compromised. The roadway could then be used as pedestrian only path and finally abandoned as a thoroughfare.

This management action would involve an audit of at-risk transport assets over various timeframes and subsequent development of an Asset Management Plan, Adaptation Policy, and guidelines.

3.2.8 Water supply, stormwater, and sewerage asset management plan

A variety of water services infrastructure is located within the 2100 hazard zone. The implications for compromised water and sewer infrastructure ranges from inconvenient to disastrous.

There are several locations where stormwater pipes discharge into vulnerable coastal environments. As shoreline recession progresses many of these will become exposed. They may also become exposed during acute weather events. Exposed pits and pipes may cause issues for safety and access. Their functionality may also be compromised because of changes in water height and ingress of debris and sediment.

Each stormwater system and the environment in which it discharges is unique and it may not be possible to identify the consequences of coastal processes until the asset is exposed.

In addition, there also exist communications and electricity infrastructure within the impacted area which are typically owned and managed by external organisations. Those organisations will also need to respond to those risks in accordance with their own management strategies.

This management action would involve an audit of at-risk services and utility assets over various timeframes and subsequent development of an Asset Management Plan,

covering Council owned assets. Inevitably, information relating to other utilities will also arise and this will be forwarded to the relevant service and utility providers. This action also includes the investigation of appropriate designs and materials for services that may become increasingly impacted by saltwater intrusion.

3.2.9 Coastal wetlands and littoral rainforests

There are several mapped areas of littoral rainforest and coastal wetlands along the coastline. The littoral rainforests have recently been remapped. An amendment to State Environmental Planning Policy (Resilience and Hazards) 2021 (RH SEPP) is required to reflect improved knowledge in these areas. Many of these rainforest areas are in danger of destruction because of changes to salt exposure and hydrological characteristics, coastal erosion, and shoreline recession.

Retreat buffers to allow littoral rainforest to migrate landward may be an option in some locations such as Wallabi Point and Mitchells Island. In other communities, for example seaward of the Old Bar Village, the stand of littoral rainforest is unlikely to persist due to coastal squeeze.

Littoral rainforest is a relatively slow-growing community and unassisted migration may not keep up with the pace of shoreline recession. It may be necessary to actively revegetate areas. To support this, endemic species should be germinated and replanted in these buffer areas. This would need to be guided by a revegetation strategy that considers biodiversity and connectivity and the relationship between other rainforest communities and stands of littoral rainforest.

Most coastal wetland areas are within private land ownership and cross the boundary between the OBMP CMP and the adopted Manning River CMP. Where relevant, the management option/s in the Manning River CMP will be carried across to the OBMP CMP. However, it is acknowledged that coastal wetlands within 2km of the coast can have very different requirements, functions, and biodiversity than those further away.

The mapping of coastal wetlands is currently being reviewed and updated for the remainder of the MidCoast. Another planning proposal will be required to implement the updated mapping for coastal wetlands.

There may be opportunities for Council to improve the hydrological condition of wetlands by considering the implications of, and opportunities in the design of roadworks and other infrastructure projects.

This action would involve preparing a planning proposal to amend the SEPP mapping for littoral rainforest (and eventually coastal wetlands) and a review of areas for coastal acquisition, considering buffers where these important ecosystems may migrate as sea-levels rise. Furthermore a vegetation strategy would be prepared, aiming to improve biodiversity, connectivity, and the relationship between other rainforest

communities and stands of littoral rainforest. That strategy would include consideration of where infrastructure projects may be designed and implemented to improve/support coastal wetlands.

3.2.10 Beach access and user management

There is a range of beach access and user management issues in the study area. These issues should be considered collectively in a Beach Access Strategy that addresses the following issues:

- Recreational 4WD Vehicles
- Commercial fishers
- Commercial use of beaches (e.g. tourist operations)
- Domestic animals (e.g. dogs, horses).

Recreational 4WD Issues

Compliance and enforcement are fundamental opportunities to manage 4WD recreation vehicles and domestic animals on beaches. Ahead of the Beach Access Strategy, greater resources could be allocated to the enforcement of existing regulations. These could be targeted at key areas and times of the year when shorebirds are nesting and there is high vehicle activity.

For some people, 4WD beach driving is an important part of the lifestyle that living in the MidCoast affords. However, growth in 4WD ownership, increasing environmental sensitivities and conflicts, increased accessibility of intra-State visitors and higher use of beaches by a range of other users means that existing policies for beach access and permitting should be reviewed.

There are 3 beaches in the study area that allow vehicles (Table 1). Boat launching access is also available at Wallabi Point.

There is evidence of conflict between beach users and vehicles, poor behaviour including speeding and littering, conflict between beach users and domestic pets and shorebirds and environmental damage to coastal ecosystems.

Table 1 4WD beach access locations.

Beach	Access Point/s	Restrictions
Crowdy Head -> Harrington	Two access points via Crowdy Head Road.	Vehicle access over the breakwall is prohibited. Shorebirds
Manning Point -> Farquhar Inlet	Access via Manning Point ramp	Shorebirds (at Manning Point Spit and Farquhar Inlet) Access to Old Bar possible when inlet is closed.
Old Bar -> Farquhar Inlet	Access via Mudbishops Point Road	Left turn only.

Beach drivers require a permit issued by MidCoast Council that outlines responsibilities and restrictions. However, these can be easily obtained from various locations with limited commitment to the responsibilities and requirements of beach driving. The permitting system needs a thorough review to address several issues included restricted access permits, out-of-area permits, permit costs and fines for non-compliance.

A fundamental issue is enforcement is relatively low. Additional resourcing to allow for greater compliance and enforcement activities is needed to address many of these issues. Alternative, remote technologies such as compliance cameras could be used in lieu of, or to supplement traditional enforcement activities in some locations.

Speed regulations can only be enforced by NSW Police, so cooperation between Council, Crown Lands, and NSW Police is required to enforce compliance.

One management option that may be considered is to require a more rigorous and formal education program whereby the issuance of a license is dependent on attendance to an educational event.

Education and signage will also play an important role in reinforcing community understanding and compliance and fencing can be used to define exclusion areas around sensitive sites.

A final issue to consider in relation to 4WD access and user management is the uncertainty over the licensing, regulation, and liability responsibilities:

3 Where there are multiple or adjoining land managers (i.e. Local Government, Crown Land and NPWS).

4 Where land has eroded, and cadastral boundaries of the private properties are across the shoreline.

This is likely to require formal legal advice. And the proposed Beach Access Strategy should consider these issues.

Commercial fishers

Commercial fishing, including the collection of bait species is regulated by the Department of Primary Industry. However, commercial fishers often seek beach access exemptions for vehicles where general access is not granted. This requires Council to open and close barriers and has resulted in barriers being damaged to gain access.

Commercial fishing is not appropriate in some location such as Old Bar Beach, Blackhead, Seal Rocks Main Beach and Forster. There is no formal policy or user agreement for granting access to commercial fishers or to define where these activities may occur.

It is Council's preference to define specific areas where commercial fishing can occur and to gate off agreed access points. Access to these areas could be regulated through a user agreement and access arrangements. The NPWS permitting system may provide an appropriate model to adapt or adopt. This includes the issuance of keys to allow permit holders to unlock specified barriers.

Domestic animals on beaches

Dogs are permitted on:

- Harrington Beach except in defined areas between August and March.
- Old Bar Beach (south of the 4WD access point at Manning Point) to North of Farquhar Park.
- Old Bar Beach (outside patrolled swimming areas).

Dogs are expressly prohibited on:

- Manning Point Spit north of the 4WD access point at Manning Point.
- Farquhar Park.
- North of Second Corner to the north of Farquhar Park.
- Within 50m of a patrolled swimming area.

These rules are routinely ignored, and greater enforcement is required. However, like 4WD vehicles on beaches, there are limited resources to enforce non-compliance.

Beaches are also used for horse riding. There is no formal policy on this. There may be different considerations for this activity over dogs.

The proposed Beach Access Strategy should review the location and extent of areas available to take domestic animals and any additional controls on timings. The rules in the former local government areas are inconsistent, so the strategy should anticipate the development of a consistent policy over both the Manning and Great Lakes areas.

Commercial uses of public beaches

The use of public beaches for commercial activities such as tourism activities and surf schools should also be considered in the proposed strategy. This may consider the appropriateness of specific activities at specified locations rather than a blanket policy to allow activities on all beaches.

Management Issues/s	Management Options/s	Responsibility
Recreation vehicle access and use **Commercial fishers** **Domestic animals on beaches** **Commercial uses of public beaches**	To prepare a Beach Access Strategy.	MidCoast Council
User management	Undertake additional compliance and enforcement.	MidCoast Council
Open space and recreation (Beach access)	Install emergency actions to reinstate beach access where possible or restrict access after an event in the Emergency Management Subplan.	MidCoast Council SES
Land managers - regulation, compliance, and liability.	Audit all Crown Land to determine where Council is and is not the land manager.	MidCoast Council Crown Lands NPWS
	Seek legal advice on the Doctrine of Accretion in relation to public beach access and use.	DPHI

3.2.11Manage important shoreline bird sites

There are various locations along the coast where, at certain times of the year, migratory and resident shorebirds nest, feed, and rest. There can be conflict between beach users, domestic animals, introduced pest animals (e.g. foxes), predatory native animals (gulls, etc.) and these shorebirds. Education, regulation, compliance, and enforcement of beach user behaviours is required.

The management of shorebird sites is a coordinated, strategic effort of a range of stakeholders, including Council, Hunter Local Land Services, NSW National Parks

and Wildlife Service, Crown Lands, the Department of Climate Change, Energy, the Environment and Water, and others.

The action would include:

- Delivering coordinated annual strategic fox controls at important shorebird sites (particularly nesting areas).
- Supporting trials of new shorebird protection measures, such as exclusion fencing and odour deterrents.
- Undertaking additional compliance and enforcement activities.

The action would be interrelated with the controls proposed for 4WD beach access (Section 3.2.10).

3.2.12 Relocate essential services at Wallabi Point

The probability hazard assessment (BMT, 2020a) illustrates that the exfiltration ponds and optical fibre network at Wallabi Point is bordering on the 1% exceedance probability of the present zone of reduced foundation capacity (shown in Figure 4, below). Therefore, these assets are vulnerable in the short-term. A strategy to relocate these is required immediately. By 2060, the modelling shows that these assets, including the electricity network servicing the exfiltration ponds will likely be undermined. By 2100, around a third of the current Council site is shown to be subsumed by the sea.

This action would involve the review and, as appropriate, address the exposure of essential infrastructure before it is at immediate risk. This will require the relocation of services as necessary (water services, energy supply, Telstra cable etc.).

3.2.13Prepare reuse strategy for Wallabi Point

In addition to the relocation activities required by the preceding action, a plan of what to do with the exfiltration ponds once they are decommissioned will be required. This may not be as simple as expected as it is expected, as the modelling indicates that the site will eventually be significantly impacted by 2100. Noting the historical use of the site, the potential for some pollutants to remain bound in the pond sediments needs to be assessed through sampling and testing. Remediation activities may be required. Beyond this, there remain a variety of potential recreational and ecological uses for the site.

This action would involve the necessary background investigations and development of a strategy for remediation and reuse of the site.

3.3 Options Not Feasible within CMP

Several actions were deemed infeasible and subsequently excluded from the multi-criteria assessment. Infeasible options include those considered too costly for implementation within the CMP, specifically actions exceeding $20M, or due to other reasons such as overlapping jurisdictional responsibilities, for instance, actions for which the State Government has primary oversight but has indicated that these won't be pursued soon. The excluded actions and their reasons for exclusion are summarised in Appendix E.

3.4 Considerations for Physical Management Options to manage an Eroding Coast

On a receding coastline, development and natural assets landward of the present-day shoreline will be at increasing risk with time and because of severe ocean storms. As the shoreline recedes and realigns to the available sediment supply, shoreline geology, changing water levels or wave conditions, the area threatened will move landward.

The shoreline within the study area is described as sediment deficient. The shoreline is slowly receding along the entire coast with periods (single storms to decades) of accelerated erosion/recession at varying locations in response to wave climate, storms and changing sediment supply (including river flooding and shoal rebuilding). Sediment movement around the headlands and offshore reefs is intermittent, with corresponding periods of wider and narrower beaches. Generally, all beaches in the study area are receding, there is little sand cover over the offshore substrate and no identified net sand sources offshore that will naturally counter this trend.

As sea-levels continue to rise government and communities must plan to accommodate the changing shoreline and increased hazards. Sea-level rise will make a continued and accelerating contribution to the shoreline realignment over time frames beyond 2100, irrespective of mitigation measures undertaken to reduce emissions. Coastal recession and erosion hazards will continue to impact areas further landward. Previous analysis of this was undertaken for Council by BMT (2020a), who prepared probabilistic hazard mapping along the coastline until 2100. The potential extent of that projected hazard by 2100 is shown along the entire study area in Figure 3, and in the sections dealing with different parts of the coastline (Sections 3.5 through 3.8).

While studies reviewed in this assessment have adopted a sea-level rise allowance of 0.9m to 2100 (in accordance with previous NSW Government policy) for the assessment of potential coastal recession and inundation, it is necessary to recognise that sea-level rise will not stop at 0.9m and is now expected to reach at least 2.0m (Cozannet et al., 2023).

All physical coastal management actions have an impact, some isolated locally while others may contribute to increased or reduced shoreline changes well away from the works (e.g. accretion updrift and erosion downdrift of a breakwater). Any measures proposed must be considered within this broader geographical context. The impact and potential implications for future generations must also be assessed.

Where low-lying areas exist landward of the present-day beach, future sea-level rise will render some existing land uses infeasible and some low-lying infrastructure inoperable. While the immediate reaction in many communities is to protect, in a significant proportion of localities, this will not be a viable long term (50-100 year) strategy. There is concern that expensive works to protect facilities over the next few decades is simply "kicking the can down the road" for future generations to address. While some areas could be protected, it will be uneconomical and unfair to do so in many other locations.

In contrast to the "stay and protect" management options are broader strategies of "managed retreat" which involves staying in place and adapting to keep settlements and infrastructure viable as long as is feasible, but then planning for subsequent relocation of assets and infrastructure to a more landward location, away from the hazard.

The recently released State Disaster Mitigation Plan for NSW (SDMP, NSW Reconstruction Authority, 2024)includes an option for managed retreat (or 'relocation') defined as:

> *"the permanent and purposeful movement of people and existing homes and infrastructure exposed to existing or anticipated effects of natural hazards. It is an option to consider for reducing risk from most natural hazards and their cascading and secondary impacts. However, the significant economic, psychological, and social challenges of managed relocation must be considered".*

While this is promoted as an option for managing risks, the SDMP also acknowledges the substantial size and cost of the issue statewide is not well understood and that the problem in NSW is substantial with:

> *"the 14,000 properties affected by 1 metre sea-level rise have a current value of around $18 to $23 billion"*

The introduction to the Disaster Mitigation Plan also states that:

> *"while some disaster scenarios are too terrible to imagine, they have a realistic probability of occurring over our lifetime".*

We know that disasters relating to natural hazards will continue to occur and that with climate change, their impacts will increase. However, the mechanisms and sources of funds for addressing the potential disasters is not yet clear.

For a coastal compartment that has recognised issues with shoreline recession, acknowledged since the early 1980s, it is important to address the long-term scenarios encompassing sea-level rise as a key planning consideration. If we only plan for the short to medium term, there is a very real risk of promoting a false sense of security and leaving a legacy situation where the impacts of future disasters are magnified. The studies underpinning the present assessment acknowledge that the precise extent of hazard at any future time cannot be accurately determined and will depend on the interaction of many variables that are themselves subject to significant uncertainty.

Realistic estimates have been provided. As sea-levels rise, coastal erosion and coastal inundation will progress significantly further landward and beyond the extents of the current 2100 hazard mapping presented in this report.

Any adopted management strategy should ensure that the present and future impacts are not creating further risks which cannot be addressed.

The physical options available can generally be put into three broad groups:

- Do nothing.
- Protection.
- Managed retreat.

These are not necessarily mutually exclusive, and elements from different categories may be implemented at different locations or times as part of an overall adaptation strategy.

1 Along the Old Bar – Manning Point Coastline, the do nothing option is generally unrealistic, allowing the natural recession of the foreshore over time with no consideration of existing development, infrastructure, or environmental impacts. It is unlikely that this would be allowed to occur with individuals and groups taking action to address the perceived hazards and protect their assets. To illustrate the do-nothing option, the hazard mapping undertaken shows the potential impact of shoreline recession for the 2100 hazard scenario. All development, infrastructure and habitat seaward of that potential shoreline could be foreseeably threatened by coastal processes by 2100.

2 The Protection Option is a decision to "draw a line in the sand". It requires the identification of a point beyond which coastal erosion and coastal inundation into the future will be avoided indefinitely. This generally requires significant engineering intervention, including structures such as seawalls or revetments, groynes, offshore breakwaters/reefs, or massive beach nourishment. Structures are designed to a high engineering standard, using durable materials (rock, concrete etc.).

Such options are frequently proposed, and sometimes implemented, to protect locations of high economic value such as extensive residential development, infrastructure, or unique habitat. Permanent structures such as seawalls or revetments are unlikely to be suitable if designed to current conditions, as sea-level rise will allow larger waves to impact on structures as the beach profile adjusts. Generally, short sections of permanent protection on a long sandy embayment are difficult to maintain without impacting adjacent unprotected foreshores.

As the beach continues to recede, it erodes the sandy beach area in front of protective works over time, preventing access along the shoreline and effectively forming an artificial headland as the adjacent beaches continue to recede. Water depths and wave heights at the structure will increase and potential scour depths at the toe of the structure will increase accordingly.

Over time the structure would require major upgrading with increased water levels and wave heights necessitating larger armour units, a lower toe level and higher crest levels. To provide this standard of "permanent" protection over a long embayment is generally cost prohibitive.

The impacts outlined (down drift erosion, loss of beach and loss of alongshore access are not in accordance with the objectives of the *NSW Coastal Management Act 2016*. Sand nourishment campaigns are often undertaken to address the loss of sand; however, widespread and effective nourishment is not practical. Sand sources for initial nourishment are not readily available at present, let alone for repeated top ups for which demand would increase over time to maintain an appropriate level of protection.

3 The Adaptation/Managed Retreat Option recognises the changes to the shoreline which are occurring and includes measures to provide limited protection (over time) with less impacts, buying further time to assess and plan for land use changes as necessary. It does not prohibit short term protection but limits the type of structures used to those which may readily be re-used, modified, or removed as appropriate (e.g., geotextile containers, rock bags etc.). Much of the study area is relatively undeveloped and this is an advantage as limited works may suffice for some time. Short term protection or 'soft' management options could be employed (such as beach scraping, focussed beach/dune nourishment etc.). These can prolong the use and condition of the beach without having significant adverse impacts elsewhere. When managed retreat is required, this approach provides time to continue to assess the beach state and the level of risk as it evolves. Any temporary protection works would be accompanied by relevant planning controls on future development. As appropriate, at-risk infrastructure and assets (roads, public and private development, and services) could be modified or relocated to

continue to service the existing community. It is a requirement that Council's Coastal Management Program be reviewed every 10 years to reassess, prioritise and fund ongoing management measures. That reassessment may well consider when a change of management approach is required.

The following sections (3.5 through 3.8) consider different geographical locations in turn, from south to north along the study area coastline. Management options which fall into the above three categories have been proposed throughout the study area and these have been subjected to the multi criteria assessment. Each management option is discussed in turn, beginning with the do nothing option for each location.

3.5 Wallabi Point

3.5.1 Do Nothing

Description

The 2020, 2060, and 2100 hazard lines for Wallabi Point are shown in Figure 4. The settlement at Wallabi Point is advantageously located behind the headland with bedrock extending under much of the town. Accordingly, the town is indicated to be generally unaffected by 2100. Further development of the town to the north or south could encroach into the hazard areas. There is potential for coastal hazards to impact Marine Drive to the west of First Rock Gully, (north of Pacific Street) by 2100.

Feasibility

The do nothing option is not feasible, at least in the long term, and would result in increased future cost and development/infrastructure at risk. While the current hazard to existing development and infrastructure at Wallabi Point is low, recession of the beaches immediately north and south of the town will continue to occur during storms.

The main short-term management approach is focussed on addressing those issues that will arise if sea-level rise projections are realised. The beaches will continue to recede. The objective is to minimise potential hazard damage that may occur. The current measures proposed are minimal but require ongoing maintenance and future planning.

Proposed management of the exfiltration ponds to the north of the town (see Figure 4) is outlined in sections 3.2.12 and 3.2.13. Beyond those actions, normal vigilance seems likely to be sufficient over the next 10 years in the areas surrounding Wallabi Point, with ongoing recession at this locality being revisited when the CMP is reviewed.

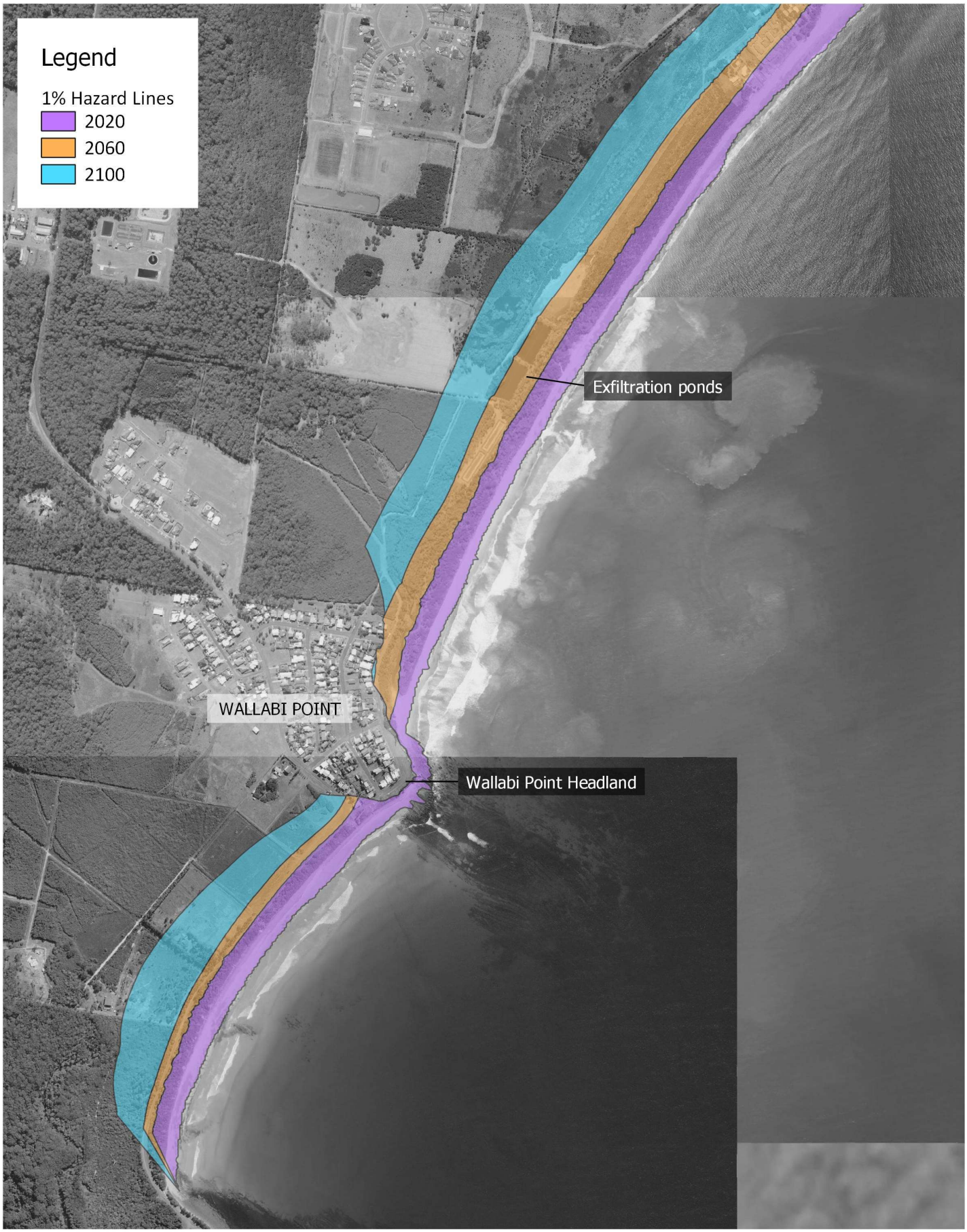

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Figure 4 Wallabi Point 1% Hazard Lines

0 200 400 600 m

Old Bar to Manning Point Options Assessment

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Salients

3.6 Old Bar

3.6.1 Do nothing

Description

The 2020, 2060 and 2100 hazard lines for Old Bar are shown in Figure 5. There is significant development along the Old Bar beach front, to the north of Wallabi Point, with immediate risk to development and infrastructure.

The development and infrastructure in the southern section of the Old Bar settlement is most at risk, with residential development adjacent to and east of Racecourse Creek (generally to the south of Clerke St.) potentially affected by 2100. This includes all development along Lewis Street and the Meridian Resort which have already been impacted.

In the absence of any management actions, the risk across the entire Old Bar foreshore will continue to migrate further landward up to and beyond 2100. The northern section of the Old Bar settlement, which includes the public school and the surf club, is in a better position due to the extensive reef offshore and bedrock underlying sections north of Racecourse Creek. The underlying bedrock may prevent beach recession but not the loss of the sandy beach. This less vulnerable area is characterised by a seaward deflection of the shoreline and is contiguous with the mapped offshore reefs. The well-known Urana Bombora, located approximately 500 m offshore, is part of this extensive reef. Development north of the surf club is sited behind bedrock (Figure 3) and is therefore protected against erosion and recession over the planning period to 2100. Further development to the north or south could encroach upon the hazard areas.

Feasibility

To do nothing is neither an acceptable nor realistic option. Infrastructure is already at risk and residential properties and infrastructure have already been lost along the beach front. Protection using various revetment designs has been proposed (with some implemented) over the past 20 years with limited effectiveness. If no action to address the foreshore recession is taken and sea-level rise projections are realised, it is very likely that large areas, particularly to the south of the town, would become unsuitable for their current land use. Protection of an isolated section of a long sandy embayment is difficult as, once protected, the adjacent areas (mainly downdrift), will experience increased erosion. Seaward of any permanent beach protection, the sandy beach will progressively erode and access along the shoreline may be lost. A revetment or seawall in isolation does not provide a permanent solution to a receding shoreline but may provide a temporary solution to extend the life of existing land uses if combined with sand replacement (scraping or nourishment). Issues relating to what is being protected, who is responsible, and who pays will always arise.

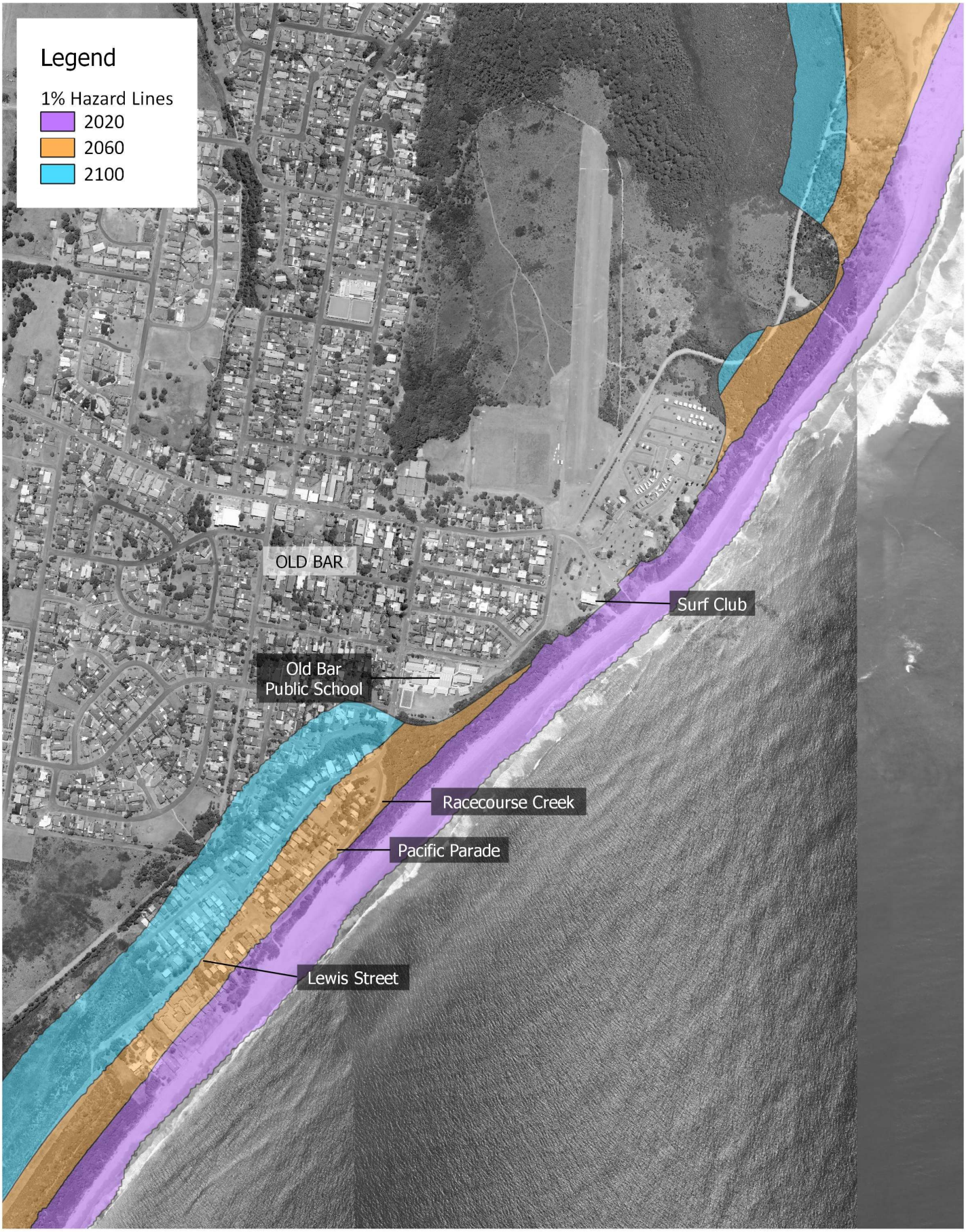

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Figure 5 Old Bar 1% Hazard Lines

0 150 300 450 m

Old Bar to Manning Point Options Assessment

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Salients

Given the extent of the 2100 hazard mapping through Old Bar, it is highly likely that sections of the township over time will become unsuitable for their present use. For example, while the Surf Club may be protected from erosion (by bedrock), the sandy beach seaward of the building will continue to disappear as the bedrock is exposed and the shoreline recedes, leaving a Surf Club without a beach. Similarly, seawalls / revetments, groynes or offshore breakwaters that are proposed to manage erosion would all subside as the nearshore profile continues to move landward, requiring major rebuilding or upgrades in future if they are to continue providing the intended protection. No single strategy offers a simple solution, and it is likely a combination of approaches will be required. These may include changes to land use, building constraints, managed retreat, short-term protection, and beach replenishment (nourishment or scraping). The options put forward in the past are described below.

3.6.2 Rock revetment wall (Lewis Street)

Description

The properties fronting Lewis Street in Old Bar are at the highest risk from coastal hazards as the beach continues to move landward. Temporary protection measures have been put in place seaward of the Meridian Resort over the past 20 years, with limited effectiveness. Dwellings have been lost at the southern end of Lewis Street. By 2100, all properties east and south of Lewis Street may be subject to coastal hazards. Given the prognosis for sea-level rise to continue (and the shoreline to continue to recede) it is highly likely that at some future time, some and possibly all development seaward of Racecourse Creek and south of Clerke Street will be affected by coastal hazards.

Studies undertaken for Council over the past 15 years have proposed rock revetments as a source of protection for the properties fronting the beach seaward of Lewis Street and, as a lower priority, further north at Pacific Parade. The revetments proposed could be constructed at the one time or constructed separately as required (Stage 1 and Stage 2). There is a distinction between them in terms of the immediacy of the risk, what is being protected and who would benefit. Irrespective, it is logical that the structures adopt a consistent design and alignment along the protected frontage, even if Stages 1 and 2 are constructed at different times. Design of the structure is shown in Figure 6.

A revetment along these isolated beach sections will not provide a permanent solution to the beach recession but can potentially afford some extended use of the properties at greatest risk, at the cost of losing the sandy beach.

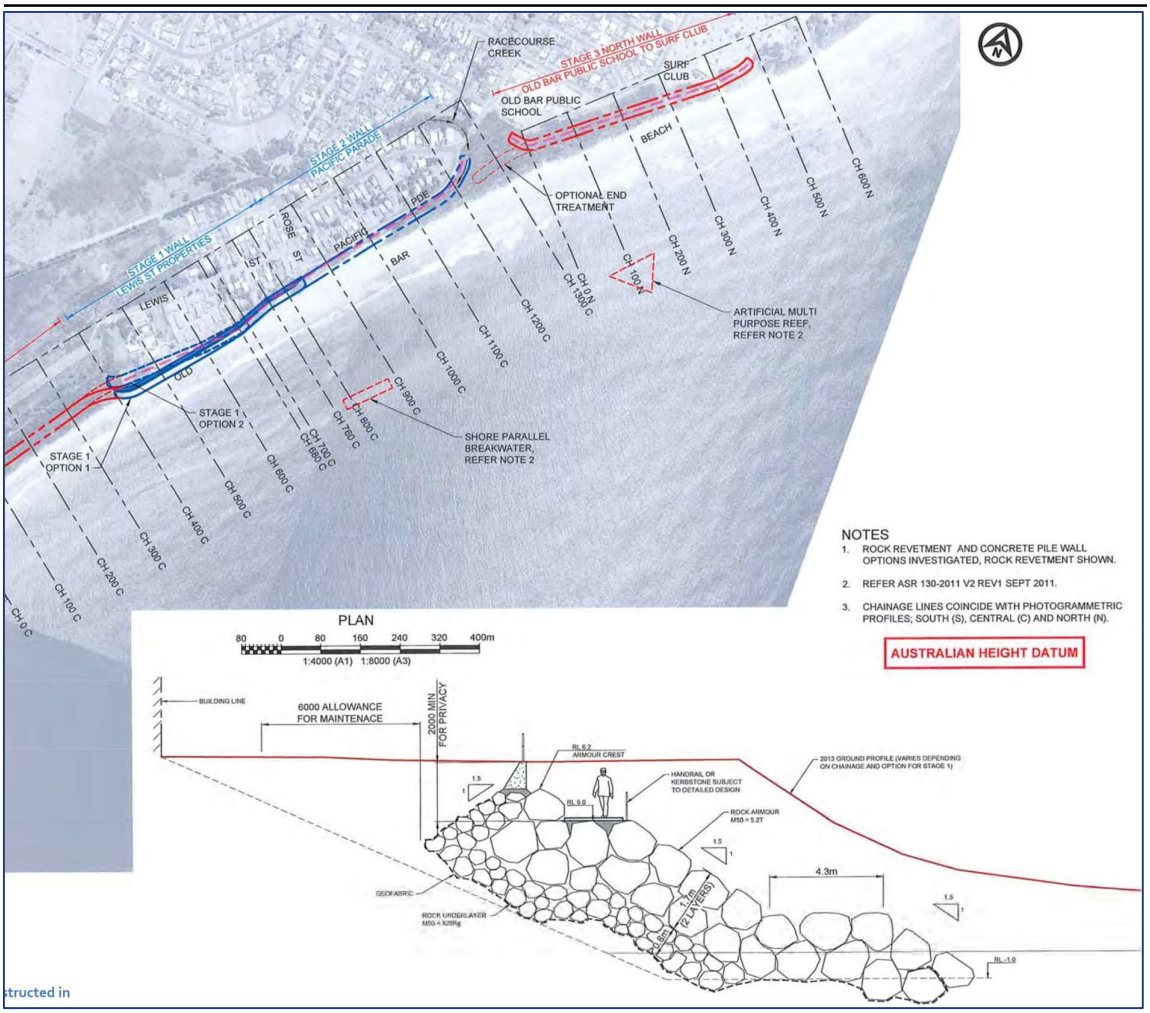

Figure 6 Proposed Rock Revetment (extract from Royal Haskoning DHV, 2013)

Feasibility

In their review of management options at Old Bar, Royal Haskoning DHV (2013) advised that effective coastal protection strategies must account for the various scales at which coastal processes occur. They concluded that no single structural solution could comprehensively address all the mechanisms of sediment loss affecting Old Bar Beach.

Royal Haskoning DHV (2013) presented a rock revetment design to be implemented in four stages, protecting: the beach South of Lewis Street to Wallabi Point; Lewis Street; Pacific Parade and north of Racecourse Creek. In assessing the various options, they concluded that such an approach will likely result in a loss of beach amenity if the shoreline continues to recede, necessitating additional engineering solutions if required. In Royal Haskoning's assessment, only Stage 1 (South end of Lewis Street to Rose Street, 450m) and Pacific Parade (From Rose Street to the Hall Street intersection, 425m) are considered. The proposed section linking the Lewis Street wall to Wallabi Point is not considered achievable (due to extent, expense, and impacts) and the

section north of Racecourse Creek is not a priority given the most recent probabilistic hazard risk assessment. Those two lengths of foreshore are not considered further here.

In constructing the Lewis Street revetment (Stage 1) the main purpose would be to protect private properties and dwellings. Current legislation would require that the structure, so far as practical, is constructed entirely within the private property boundaries with the owners of the properties taking full ownership and responsibility for maintaining the structure. Any erosion caused by the structure either seaward or downdrift would need to be addressed by the owners. Appropriate funding arrangements would be required.

In siting a revetment such as this, it is preferable that the structure be as far landward as practical, acknowledging the need for sufficient space landward of the crest for any maintenance works and to ensure the stability of existing development. On a receding beach this minimises the frequency of exposure of the revetment to wave action and maximises the length of time until the beach width is reduced to zero.

Advantages

- Provides a site-specific solution to the properties immediately at risk.
- Provides a certain security to the properties and infrastructure further landward while it can be maintained.
- Provides ongoing use of the properties while a longer-term strategy is developed for and implemented in the area.
- Council / community funding not required.

Disadvantages

- Unlikely to be sustainable indefinitely as sea-levels rises, and the foreshore recedes. For this reason, unlikely to be approved at present.
- Would result in loss of beach width, amenity and alongshore access seaward of the structure during / following storms and as the beach recedes over time.
- Access along the beach would eventually be restricted to the wall crest.
- Potential for increased erosion adjacent to the seawall and particularly downdrift (to the north).
- Small scale nourishment and / or beach scraping may not address the sand loss.
- Arrangements are needed to cover costs of ongoing maintenance and potential beach remediation.

3.6.3 Rock revetment wall (Pacific Parade)

Description

The development along Pacific Parade and adjacent to Racecourse Creek is at risk in the short-term and increasingly over time. There is a buffer seaward of the properties of approximately 45m at Rose Street increasing to 95m at Hall Street. This buffer contains Pacific Parade, the lower section and entrance to Racecourse Creek, and a vegetated foredune and back dune fronting David Street and stretching north past the Old Bar Public School to the Surf Club. The Stage 2 revetment as proposed (see preceding section) is 425m long and adjoins the Stage 1 revetment at Rose Street. It follows, approximately, the landward bank of Racecourse Creek seaward of the vegetated area and Pacific Parade for 425m. The revetment is proposed to be constructed on Crown Land, and while providing protection to the residential development on the landward side of Racecourse Creek, would also be protecting Pacific Parade and a section of the vegetated back beach on the south side of the creek. Construction of the revetment would disturb or remove part of the vegetation along Racecourse Creek. The design as proposed by RH DHV (2013) is shown in Figure 6.

Feasibility

The Stage 2 construction could be undertaken at the same time Stage 1 (Lewis St.) with potential cost efficiencies or could be postponed until required or a final management strategy is adopted. The revetment would be on the seaward side of Pacific Parade and would most probably be constructed on public land. The capital and maintenance costs and funding arrangements would need to be negotiated, balancing State government, Council, and private contributions on a beneficiary-pays basis. As the beach recedes, the revetment would effectively become a training wall for Racecourse Creek as the beach disappears and the entrance retreats to the north.

Advantages

- Provides a site-specific solution to the protection of Pacific Parade and properties immediately at risk.
- Provides a certain security to the properties and infrastructure further landward on the southern side of Racecourse Creek, while it can be maintained.
- Provides ongoing access to, and use of the properties while a longer-term strategy is developed for and implemented in the area.

Disadvantages

- Unlikely to be sustainable indefinitely as sea-levels rise and the foreshore recedes.

- Would result in loss of beach width / amenity seaward of the structure during and following storms with this impact increasing as the beach recedes over time.
- Potential loss of access along the beach and across Racecourse Creek entrance.
- Potential for increased erosion adjacent to the seawall and downdrift (to the north) into the remaining dune vegetation.
- Small scale nourishment and/or beach scraping may not address the sand loss over time.
- Arrangements would need to be negotiated to cover costs of ongoing maintenance and potential beach remediation.

3.6.4 Submerged breakwater structure / multipurpose reef

Description

Assorted configurations of submerged reefs and emergent breakwaters have been proposed for specific locations at Old Bar to retain a sandy beach in the long term. These structures may be positioned seaward of proposed revetments or as standalone foreshore protection by forming a salient or tombolo. Royal Haskoning DHV provided analysis of a multi-purpose reef and a shore parallel breakwater for comparison to the rock revetment which they eventually recommended (Sections 3.6.2 and 3.6.3).

The offshore or multipurpose reef consists of a structure built up from the seabed but remains submerged, creating a localised wave break and reducing the wave energy at the shoreline. Similarly, the shore parallel breakwater uses comparable construction methods to build an emergent rock wall parallel to the shoreline. This wall significantly reduces wave energy on the shoreward side, functioning similarly to a harbour. While sand can still move along the shoreline, this occurs at a reduced rate due to the sheltering effect of the breakwater, forming a salient in the lee of the structure at the shoreline. The emergent breakwater features a low crest level, allowing waves to overtop the structure.

Feasibility

The feasibility of using a submerged reef and/or offshore breakwater structure has been examined on several occasions for various locations on the NSW coast, with those studies consistently reaching similar conclusions. MHL (2017) considered this option for Old Bar, advising that:

> *"…the offshore reef concept, have been previously assessed in considerable detail (WRL, 2012). The offshore reef concept was associated with a considerable degree of risk and uncertainty. It was seen as likely to be ineffective from a coastal protection perspective with potential to even exacerbate erosion during storm events due to potential super-elevation of the water level between the reef and the*

shoreline. As such, this option will not be discussed further herein and is not expected to warrant further consideration as a long-term management option for Old Bar."

While the use of artificial reef structures continues to be raised by communities, on the Australian east coast they have proven to be mostly ineffective at providing reliable coastal protection. Part of their attraction is that they are not visible from the coast and may provide other recreational and/or habitat benefits. For these structures to be submerged, they must be constructed with a crest below the lowest tide levels. Considering the semi diurnal tidal range in NSW, which is approximately 2m, and making allowance for storm surges at high tide, the crest level is set around 3m below the surface (during a storm). This allows significant waves (3m or more) to pass directly over the top without breaking, precisely at the time when they are supposedly protecting the beach.

Submerged reefs and emergent offshore breakwaters can be constructed from a range of materials such as geotextile containers, rock, and concrete armour units. They are difficult and expensive to construct. Their effectiveness is dependent on wave conditions and water levels, and their impact can sometimes be detrimental. These structures must be constructed in coastal waters owned by the Crown and are unlikely to be approved if any other solution is available.

Advantages

- Desired outcome is a sandy beach shoreward of the structure.
- May not be visible from the shoreline (submerged or multi-purpose reef).
- Perceived additional benefits (multi-purpose reef: surfing, fishing, ecology).

Disadvantages

- Who pays? Who owns it? Who is responsible?
- Unlikely to gain approval to be constructed on Crown Land.
- Performance is uncertain, possibly detrimental.
- Difficult to construct with very high capital cost.
- High maintenance.
- Need to raise the crest as sea-level rises and/or the structure subsides.
- Potential safety issues (boating, rips, currents).

3.6.5 Geotextile Sand filled Container revetment

Description

The rock revetments discussed in Sections 3.6.2 and 3.6.3 could also be constructed in a range of different materials. Amongst these are geotextile sand filled containers (GSCs) which have been used in various locations and configurations in NSW over the past 30 years. The containers themselves are selected to fit the application and exposure, varying from pillow shaped bags of various sizes to large cylindrical mega containers. They are filled with sand by hand for very small units, by front end loader using a jig to hold larger bags, or by direct pumping of a sand slurry into mega-containers. The size of the units is dependent on the design objectives. Sand is generally sourced directly from the beach to fill the bags on site, often with a significant cost saving over the cost of importing and placing large armour stone.

The application and durability of the geotextile units is still uncertain due to limited field performance data and only rudimentary laboratory testing and design guidelines. They are generally considered a temporary solution and are susceptible to vandalism, accidental damage, or failure under wave loading. There have been many instances of failure of these units in exposed locations, although they have also proven effective in some cases. Where a revetment is required, particularly in more sheltered locations or for temporary protection, they are a unit which could be considered.

In recent years, a new 5.0m^3 bag, which is twice the size of previously available bags has been available on the Australian market.

Feasibility

These units are more suitable for temporary structures, perhaps while the long-term strategy for the area is being determined. They are generally designed to a lower standard than an engineered rock revetment and are frequently used in emergency situations. They can effectively provide protection against minor storm events or for short durations as needed, and offer the benefit of being removable, allowing the sand filling to be returned to the active beach. However, the geotextile material from failed units can be challenging to retrieve once buried in the beach, introducing unnatural materials into the marine environment. Repairs can be difficult if a container in the centre of the structure or at the toe fails, as it is difficult to remove and replace once the wall section has started to slump. The units also remain susceptible to vandalism and accidental damage.

Advantages

- Cheaper solution for less permanent protection.
- Can be removed when no longer required.

- Can be readily topped up or extended if required.

Disadvantages

- Can be unattractive when exposed.
- Less experience of long-term performance and design guidelines than for rock revetments.
- Relatively easily damaged by vandals or accidents with equipment operating on the beach.
- Require careful consideration of access to beach and drainage.
- Conflicting opinions on design in literature.

3.6.6 Rock filled bag revetment

Description

Rock bags are a relatively recent innovation for protection works in exposed locations on the Australian East Coast. They consist of an open nylon rope (or similar) mesh bag which is filled with rock and then attached to a steel collar and lifting ring. The bags employ small rock held together to provide a heavier single unit.

The weight of each unit is dependent on the size of the bag and the density of the rock used, although igneous rock is specified. Smaller rock is generally more readily available and cheaper to transport than large armour stone, with a consequent cost saving. As with the geotextile containers, the rock bags are filled on site and lifted into place to form a revetment. There is very little local experience with their use in exposed coastal locations and limited design guidance. They are popular for their ease of placement and recovery using the lifting ring should the protection no longer be required. If undamaged, they may be reused without emptying the bag by simply lifting, transporting, and placing in a different location. They are generally more robust than GSCs but still susceptible to persistent vandalism and accidental damage.

Feasibility

The rock filled bags, like the geotextile containers, are more suitable where a temporary structure is required, or short-term protection is appropriate. They are generally designed to a lower standard than engineered rock revetments and are becoming more commonly used in emergency situations. They can be effective at providing protection against milder storm events or over a shorter period. They have the advantage of being removable and reused, or the rock filling recovered away from the beach. Repairs and topping up of the structure are relatively straightforward.

However, until more experience is gained, and additional design guidelines are presented, the use of these units on an exposed beach location should be regarded as somewhat experimental. We are unaware of any location in NSW (to date) where these units have been exposed to a severe storm on the open coast.

Advantages

- Cheaper solution for less permanent protection.
- Can be removed when no longer required.
- Easy to reuse if the protection is no longer required.
- Can be readily topped up or extended as required.

Disadvantages

- Can be unattractive when exposed.
- Much less experience of long-term performance and design guidelines than for rock revetments.
- Relatively easily damaged by vandals or accidents with equipment operating on the beach.
- Require careful consideration of access to beach and drainage.
- Should currently be regarded as experimental when deployed in exposed ocean beach locations.

3.6.7 Property purchase

Description

On beaches experiencing accelerated recession due to climate change, there will be locations where the current land use becomes no longer viable. This can occur when the combination of higher water levels and recession result in the complete loss of land to the sea, or the frequency of inundation becomes unmanageable. It can also result from the loss of access or infrastructure to service the land use requirements. In such cases, the only option left may be to remove development from areas close to the beach and the buy back of property may form part of this strategy.

This scenario can affect various types of land use, including areas of farmland that are no longer viable, residential, or commercial development and infrastructure where access and services cannot be maintained, or where the land itself becomes unsuitable. Planning for such outcomes is difficult and involves long lead times to be accomplished with minimal disruption, rather than as a disaster response.

The scientific community warns that Governments should be planning for sea-level rise beyond 2m, a change that would significantly alter population centres and land use globally. The NSW Government have identified this issue in their recent State Disaster Mitigation Plan (NSW Reconstruction Authority, 2024), providing guidance to assist communities to plan to relocate rather than to try and protect land and development from high risks associated with natural hazards. The plan provides guidance and foresight as to how this may be achieved where no other viable option exists. As with flooding, these outcomes are likely to be felt harder in regional areas where lower population density makes the unit price of protection too high, and relocation becomes the cheapest long-term option.

This option should be given serious consideration for parts of the Old Bar settlement and adjacent lands. The option is also worth considering for Manning Point. It does not require the immediate removal of development at long-term risk but rather encourages the development of a plan that takes those changes into account in a timely manner. It can inform decisions taken in the intervening period and avoid the implementation of expensive and ultimately inappropriate management measures. It can facilitate the appropriate siting of infrastructure and new development which doesn't place an unnecessary legacy burden on future generations.

Feasibility

Consideration of managed retreat, while a sensitive issue, can be achieved with sufficient forward planning. It is appropriate where long-term projections show with some certainty that the current land use is not going to be viable, and can be implemented through a process of monitoring, managing, and responding at appropriate times. Ultimately, the option aims to avoid "knee-jerk" emergency management in the future with a more strategic approach and starts with an appropriate understanding of the risks which are now available. It requires a concerted and sensitive effort to educate communities and to provide a pathway to an alternative future.

The preparation of an appropriate plan will identify a range of options and actions to achieve a satisfactory outcome. These may include property purchase, land swaps, development and planning controls, rezoning, strategic protection, and remediation works.

Advantages

- Uses the science to plan for the future.
- Minimises future problems from poor siting of development, infrastructure, and land use.
- Reduces dependence on emergency management through planning.

- Adequately caters for future generations.

Disadvantages

- A sensitive issue to discuss and address.
- Requires hard decisions to be made.
- Unclear who would pay at present.
- Failure to act appropriately now may impact future costs of future recovery.

3.6.8 Beach scraping

Description

Beach scraping is the process of moving sand landward across the beach to increase sand reserves within the back beach and dune profile in anticipation of storm events. It is usually undertaken at times when the beach is recovering after storms or when the beach profile is accreted.

Importantly, beach scraping does not provide a solution to long-term beach recession that is driven by either an alongshore sediment deficit (more sand leaving the compartment than entering it) or rising sea-level (landward movement of the offshore profile, the "Bruun Rule"). It does not add sand to the active beach system, but rather borrows sand from one part (typically the beach face, where waves run up and down the beach), to bolster the sand reserve at locations of concern (commonly the base of the dune at the back of the beach).

Beach scraping is sometimes referred to as "Nature Assisted Beach Enhancement" because the process artificially accelerates the natural dune recovery process which happens after a storm. The natural process may take months or years to restore a beach dune to the pre-storm volumes. The impact of beach scraping is a reduced amount of sand moving alongshore, which is ultimately balanced by additional erosion of the beach and profile downdrift. Because the volumes involved in beach scraping are small, the increase in erosion downdrift may appear negligible. Beach scraping is becoming a common practice in beach management in New South Wales.

Feasibility

Beach scraping is a useful management tool to aid recovery of a beach section. It does not, however, address the underlying long-term recession of the beach, which would require the addition of sand to the compartment from outside the active beach system (beach nourishment). It is used to reduce the apparent impacts of a storm event (hiding or flattening the erosion escarpment, improving beach access, creating an accreted beach). It does impact the beach processes downdrift, but the measurable impact of that increase is minimal and widely accepted. It also contributes to beach amenity at

the more heavily used beach sections and may assist in prolonging the usability of back beach infrastructure and, potentially, development behind the dune.

Advantages

- Relatively cheap and easily undertaken as part of general Council beach maintenance on an opportunity basis.
- Improves beach amenity more quickly than natural recovery following an erosion event.

Disadvantages

- Is often seen as a solution to long-term recession problems.
- Does not add additional sand to the beach compartment but simply redistributes the subaerial sand store to where it is most effective in providing a storm buffer at the expense of downdrift beaches.
- Becomes another ongoing cost in managing the beach.

3.6.9 Flexible adaptation (including Managed Retreat)

Description

A receding beach undergoes changes due to factors like storm events, alongshore sand supply, and sea-level rise. A flexible adaptation policy focuses on prolonging usability of the beach, development, and infrastructure, rather than attempting to maintain a fixed limit to shoreline recession. In some locations in South East Australia, attempting to maintain a consistent shoreline will be unsustainable due to physical changes to the beach, the cost to maintain, and lack of resources (sand sources, suitable rock, funding).

A flexible adaptation policy employs measures that are temporary and achievable in the short term, allowing for adjustments in response to anticipated long-term environmental changes. This approach would typically include low-impact beach management strategies such as installation of removable or temporary protection structures, beach scraping, opportunistic beach nourishment, dune regeneration, and community education, together with longer term planning measures. It also involves planning to ensure new development is undertaken in suitable locations and ultimately reduce the reliance on both emergency response and increasingly expensive defence measures to arrest beach recession and reduce coastal hazards. In many locations, holding the line is not going to be achievable. Council resources are already stretched, and State and Federal Government resources will not be available to address every issue.

Feasibility

To retain the current position of the coastline while retaining beach amenity and sensitive nearshore ecology is expensive and is likely to increase exponentially in already vulnerable coastal areas. The objective of a flexible and adaptive approach is to avoid present-day decisions which lock in long-term commitments and to maximise the time which development can realistically remain in its present location.

Advantages

- Provides a clear picture for communities of what may happen and what will be permitted, facilitating wise decision making to minimise future failures.
- Allows measured steps towards a changed environment rather than simply trying to prevent it happening.
- Facilitates community understanding and participation in the decision process.
- Spreads costs and responsibility across the community.

Disadvantages

- Not necessarily popular with sections of the community who may feel ignored.
- May result in short term damage to and/or loss of existing development, infrastructure, and amenity in some high-risk areas.
- Requires a whole of community commitment to long-term planning and implementation.

3.7 Farquhar Inlet

3.7.1 Do nothing

Description

The probabilistic hazard assessment (BMT, 2020a) indicates broad scale recession of the entrance barrier and shoals at Farquhar inlet over a length of 4.5 kilometres between the Scotts Creek to the north and the southernmost location of the current entrance. With sea-level rise, the entire coastal barrier and entrance shoal complex is likely to move upward and landward due to the processes of wave runup and tidal processes that control their formation. As sea-levels rise, an additional sink for sediment will be created as the internal shoals accumulate more sand to "keep up" with rising water levels.

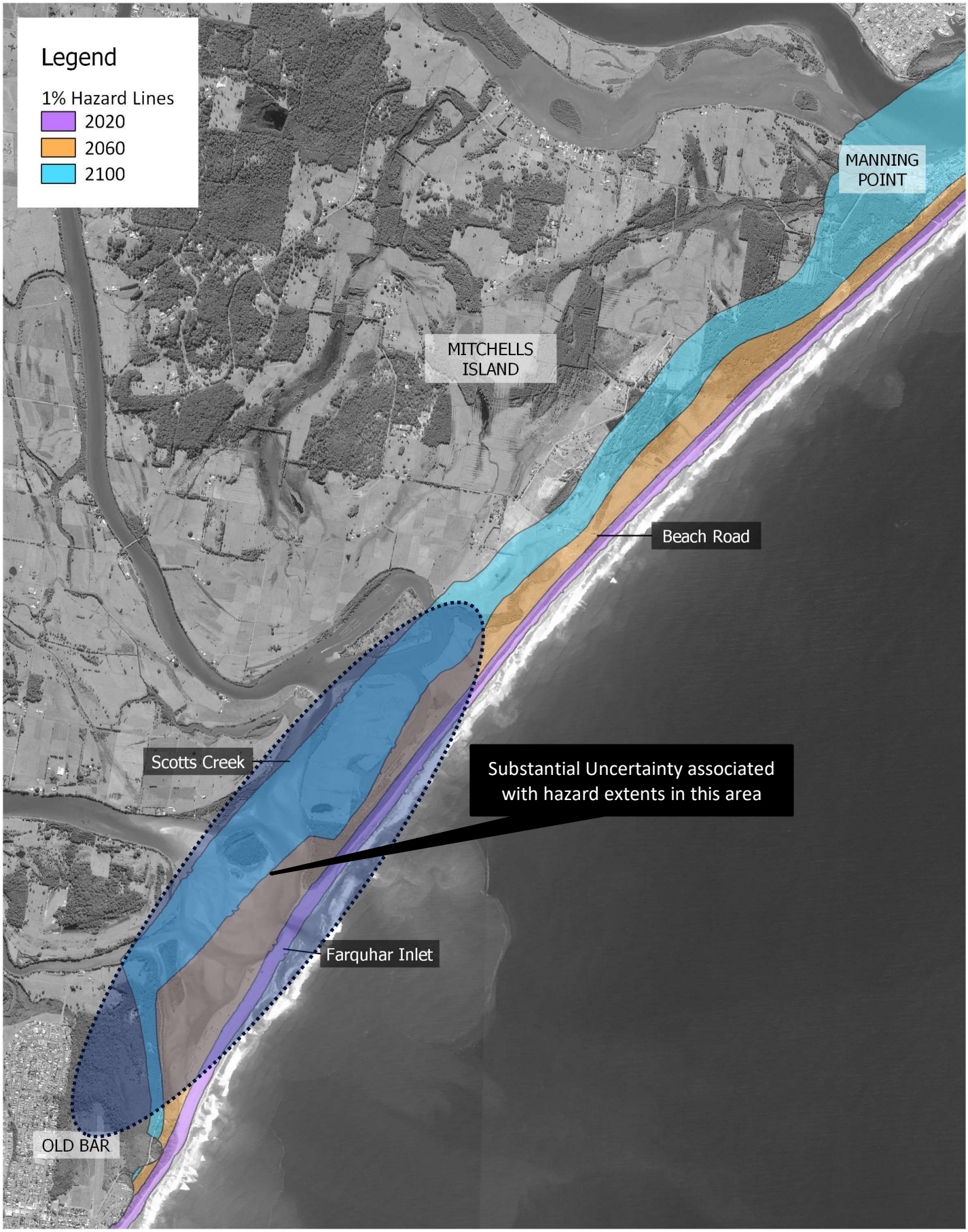

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Figure 7 **Farquhar Inlet to Mitchells Island 1% Hazard Lines**

0 0.5 1 1.5 km

Old Bar to Manning Point Options Assessment

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Salients

Several management options have been considered in the past, with management concern focussing on issues such as flooding, navigation, and water quality in Farquhar Inlet rather than coastal erosion or recession. The options primarily focus on the inlet rather than directly addressing the open coast erosion and inundation issues. However, the state of the entrance (either natural or managed) may impact the adjacent open coast and are therefore included for assessment.

Present management activities such as dredging, and entrance opening may make sand available for beach replenishment (south of the entrance) or reduce the alongshore supply as the shoals re-establish. The trigger and approach to managing the entrance is continually monitored and reviewed as appropriate.

Over the long term, the inlet should be considered as a net sediment sink, as rising sea-level will capture sand moving along the coast to raise the level of the inlet shoals, commensurate with the rate of sea-level rise as described Section 2.3. In the short term, the estuary acts as a both a source and sink, depending on the entrance opening closing processes. The entrance experiences repeated cycles of barrier overtopping and channel flushing (flooding and entrance break out) shoal rebuilding and the entrance closing.

The volumes of sand entering and exiting the entrance are significant and intermittent, averaging more than 50% of the net average alongshore sediment transport at the inlet entrance, based on the most recent studies (Maritime Infrastructure Delivery Office, 2022).

Feasibility

The do nothing option is not realistic, with maintenance dredging and entrance management measures already being employed in the lower estuary over several decades. These measures are currently aimed at managing water quality and limiting riverine flooding impacts. Both these strategies, while outside the scope of this assessment, affect the sediment transport rates at the entrance significantly and impact the stability of the beaches, particularly to the north. It is not likely that the current estuary management measures will be halted.

Advantages

- Cessation of estuary management interventions would return the estuary to a more natural system.

Disadvantages

- Increased flooding levels and frequency in the lower catchment.
- Increased shoaling in channels and a reduction in navigability.

- Larger variations in estuary water quality, adversely affecting the oyster and established agriculture in the lower catchment.

3.7.2 Dredging to keep entrance open

Description

A proposal was presented in Worley Parsons (2010b) to dredge and maintain a permanent entrance at Farquhar inlet. The key objective of this proposal was to dredge a navigable channel through the inlet shoals and to maintain that channel by dredging as required. The objective was specifically to reduce flooding impacts in the lower estuary, to improve navigability, and to 'improve' water quality by increasing tidal exchange and reducing flushing times in this part of the estuary. While the proposal did not specifically address coastal processes, they highlighted the possibility of using sand dredged from the shoals and channel for beach nourishment, by pumping it to Old Bar foreshore to the south. All sand in the lower estuary is part of the active coastal system and when dredging or removal is required, any sand removed will eventually be replaced by sand from the open coast with time.

Feasibility

The plan as presented required the access to a dredge and crew for 35 days per year in the first year (approximately 50,000m^3 based on unit costs presented) and an additional 25 days per year for the following 30-year design period (approximately 30,000m^3/year). The dredging requirements presented by Worley Parsons were estimates only, and there seemed to be limited justification for the proposed extraction volumes.

Some of the sand 'won' by the process was to be used to establish sand islands adjacent to the channel inside the entrance. Subsequent studies for beach nourishment alone as an option for Old Bar are summarised by Royal Haskoning DHV (2013) as follows:

> "*Sand volumes required to nourish Old Bar Beach are estimated to be in the order of 1,000,000 m^3 initially, with subsequent nourishment campaigns of around 1,000,000 m^3 required approximately every 10 years (WorleyParsons, 2010b). The total cost to implement such a scheme is estimated at $147.1 million (WorleyParsons, 2010b), which is clearly not viable. In addition, it may not be possible to fully source such significant sand volumes from the local sources identified above, with additional offshore sand sources required to meet the nourishment volumes.*
>
> *Costs could possibly be rationalised through the implementation of a sand back-passing system which transports sand onto Old Bar Beach via pipelines from Farquhar Inlet and/or offshore depositional areas. A better understanding of regional sediment transport processes would be required*

to further assess the feasibility of this option, including potential impacts on Farquhar Inlet and Manning Point Beach. In any case, the scale and cost of such a scheme would likely exclude this as a viable option."

The entrance dredging as proposed is well short of providing a reasonable solution for nourishment of the Old Bar sediment compartment. Whether the proposed works would be successful in maintaining the entrance channels and achieve the estuarine objectives is not certain. The work has not been fully costed or assessed for feasibility and potential impacts. The impacts of the projected coastal hazards on the project over the nominated planning life and beyond are not addressed.

Advantages

- If successful, may address Farquhar Inlet issues relating to flooding, navigation and water quality while providing a source of sand for some beach nourishment at Old Bar.
- Highlights the dredging of the entrance and lower estuary undertaken at present and the opportunity for sand dredged to be returned to the active beach system which is sediment deficient.

Disadvantages

- Potential Impacts are not fully assessed (Little Tern, estuarine ecology, open coast impacts). EIS recommended before proceeding further.
- Scope of the project is beyond the capacity of Local Government requiring State Government funding and approvals.

3.7.3 Dredging and training structure

Description

A modification to the dredging was also presented by Worley Parsons (2010b) including dredging and maintaining a permanent trained entrance near the southern limit of Farquhar inlet, with the addition of a training structure. This would result in less sediment transport into Farquhar Inlet during normal tidal flow conditions compared to an entrance in a central or northern location. The option to dredge an entrance at the southern limit of the inlet was investigated to involve the use of a "mini-dredge" to dredge material from within the inlet and potentially transfer it to Old Bar Beach or other locations for nourishment. The Worley Parsons proposal was divided into 3 sub options:

1 Dredging works to create and maintain an entrance along the existing "soft rocks" at the southern edge of Farquhar Inlet, north of Old Bar.

2 Combine this dredging option with construction of a sub-surface training wall and breakwater using geofabric Mega Containers.

3 Combine the dredging with construction of training walls and breakwaters using a combination of geofabric Mega Containers and 250m of rock armour training wall and breakwater.

One, two or all three proposals could be implemented with commensurate increase in capital and maintenance costs.

Feasibility

The work proposed would involve major construction within the estuary and nearshore and would be difficult to justify based on the proposal as presented in 2010. The scope of work is likely to be beyond the capacity of a Local Government, requiring funding and approvals from the State Government to proceed. It is uncertain whether the management objectives being addressed in the estuary would be successful.

Advantages

- If successful, may address Farquhar Inlet issues relating to flooding, navigation and water quality while providing a source of sand for beach nourishment at Old Bar.
- Highlights the dredging of the entrance at present and the opportunity for sand dredged to be returned to the active beach system which is sediment deficient.

Disadvantages

- Extremely high capital dredging and construction cost with substantial ongoing maintenance dredging required to maintain the channel.
- Impacts not fully assessed, EIS recommended before proceeding (Little Tern, estuarine ecology, open coast impacts).
- Maintenance of a permanent entrance would permanently prevent vehicular access along the shoreline.
- Scope of the project is probably beyond the capacity of Local Government requiring State Government funding and approvals.
- Impacts of potential long term shoreline change have not been evaluated.

3.7.4 Dredging to form Lake behind closed beach berm

Description

A proposal was presented by Worley Parsons (2010b) to dredge a lake at Farquhar Inlet, which would require the removal of up to 200,000m^3 of sand over 160 days, with

the dredged material transferred for beach nourishment activities at Old Bar Beach or simply pumped to the ocean side of the beach berm to proceed along the shoreline to the north.

The rationale for the dredging is somewhat unclear as it is presented as a one-off dredging, forming a deep lake where the shoals currently lie. It would permanently close the entrance but does not seem to identify how the entrance would be prevented from opening during major floods. Allowance is included for an additional ten days dredging per year to maintain the lake.

Feasibility

Benefits of the proposal appear minimal, other than to create a one-off sand source that could be returned to the active beach system. The dredging would substantially change the estuary at considerable cost and would not positively address issues relating to water quality or flooding. The scope of work is likely to be beyond the capacity of a Local Government, potentially requiring funding and approvals from the State Government to proceed. Such approval is unlikely.

Advantages

- Creates a safe lake disconnected from the ocean that may provide various recreational opportunities.
- Permanently closing the entrance would facilitate recreational vehicle access along the beach from Manning Point to Old Bar.
- Creates a one-off source of 200,000m^3 of sand to be used for beach replenishment.

Disadvantages

- Unlikely to survive the first flooding event without major maintenance.
- Unlikely to receive Government support or approval.
- Environmental impacts not fully assessed, with potentially adverse impacts on the ecology of the lower estuary. No assessment is included.
- Potential adverse impacts on water quality and increased flushing time.
- Limited perceivable benefit to the open coast.

3.8 Mitchells Island and Manning Point

3.8.1 Do nothing

Description

Over many years, the foreshore of Mitchell's Island has been recognised as one of the most obviously eroding stretches of coastline on the NSW coast. This is reflected in the hazard lines presented in Figure 7.

The 1% coastal hazard line plotted for 2100 extends approximately 450m landward of the present-day dune escarpment at the Beach Road access, and up to approximately 1km inland at the Manning Point township on the banks of the Manning River. It encompasses the whole town, including Manning Point Road, which is the only road into the town.

The 1% coastal hazard at Manning Point (Figure 8) includes the entire spit within the 1% probability coastal hazard area by 2100. The adjacent river is shown as a high area of uncertainty and may change significantly if the river entrance relocates or if Manning Point Spit is breached.

South of the Manning Point township, farmland, associated buildings, homes, and roads are within the 1% probability zone to 2100 over the whole Island frontage. This includes the sewerage treatment plant which is immediately south of the township behind the beach and presently within 50m of the erosion escarpment crest. The township itself and the island foreshore are increasingly at risk of flooding. The beach is backed by a substantial dune face with a near vertical erosion escarpment. During high tides, the wave runup is at the base of the scarp and during storms the scarp erodes. Much of the area behind the single dune is very low-lying.

Feasibility

To do nothing is not an option for the section of coastline fronting Mitchells Island and Manning Point to the Manning River entrance. Should the coastal hazard projections to 2100 eventuate, the Manning Point township and much of the seaward part of Mitchells Island will be unviable for continuing occupation. The difficulty is to find a long-term approach that is implementable and affordable. Structural options such as seawalls, groynes and offshore reefs are not appropriate nor affordable over a 5km length of coastline. Beach nourishment is not viable as no suitable sand source exists, other than the nearby shoals in the lower Manning River estuary. Erosion of the foredune will continue beyond 2100.

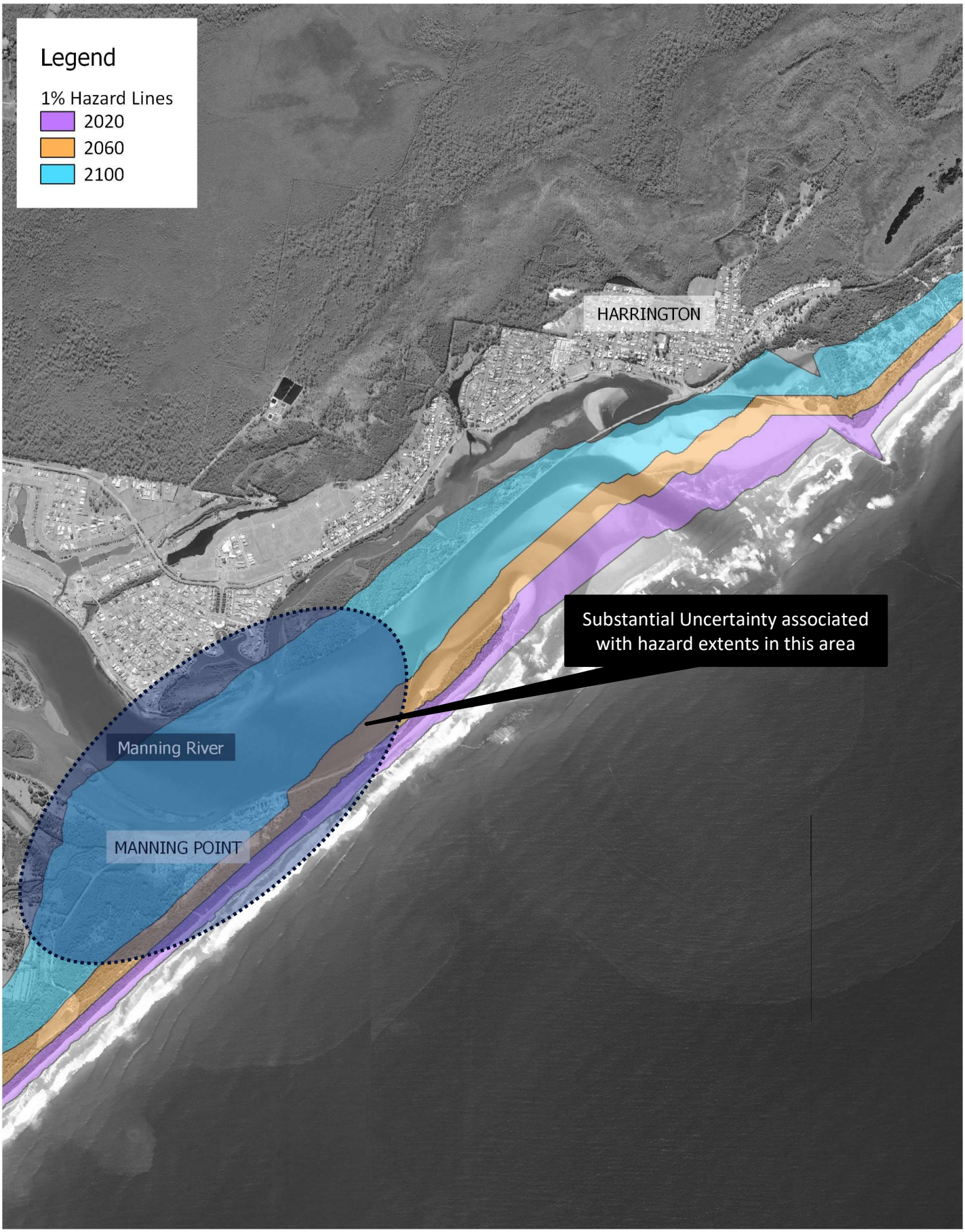

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Figure 8 Manning Point to Harrington 1% Hazard Lines

Old Bar to Manning Point Options Assessment

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0 0.25 0.5 0.75 1 km

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Salients

While the State Government has recently considered major works to stabilise and improve the river entrance, those works would not be undertaken by Council and fall outside the scope of this assessment. Irrespective of any options selected, they are unlikely to significantly improve the outlook for the town or the spit. Some of the works, if undertaken, may provide opportunities to address the breakthrough of the spit by the river. Other options including dredging components may provide access to suitable sand for beach replenishment. Should major works be undertaken, they should at least consider any opportunities to address the high risk of the loss of Manning Point and the township. Assessment of those options and potential opportunities are beyond the scope of this review.

3.8.2 Manage Mitchell Island foreshores with "soft" options.

Description

The shoreline fronting Mitchell Island is straight with a significant alongshore sand transport rate and a high single dune along the coast. It is important to maintain that dune to limit potential storm runup and wave erosion.

The conceptual model of sand transport prepared by the Maritime Infrastructure Delivery Office (2022) shows an increasing alongshore sand transport rate from 109,000m^3/year north of Farquhar inlet to 168,000m^3/year at the entrance of the Manning River. Some sand moves into the river entrance and onto the shoals and some bypasses the entrance (90,000m^3/year), with 10,000m^3/year deposited on Harrington Beach and 49,000m^3/year moving around Crowdy Head and out of the sediment compartment. The 50,000m^3 to 60,000m^3 increase in sand transport along Mitchell Beach is fed by the loss of sand from the beach profile (i.e. recession).

It is appropriate to undertake measures to protect the dunes and, where possible, to reduce the erosion rate. Such measures include dune rehabilitation, beach scraping when appropriate and opportunistic beach nourishment.

Feasibility

The reality is that soft management measures alone are unlikely to significantly reduce the rate of foreshore recession on an exposed beach with underlying sediment deficit and rising sea-levels. Such measures are good practice and do no harm but fall well short of a solution to the recession.

Advantages

- Good practice which encourages community to take an interest and learn about the issues.
- There is time to prepare and implement a strategy as development along the island is relatively low density with most existing houses well back from the beach.

Disadvantages

- Are unlikely to significantly address the long-term problems.

3.8.3 Manning Point: Beach scraping, nourishment, and dune management

Beach scraping can be undertaken along Manning Point to reduce the likelihood of any breakthrough of the spit during storms or by the river. Beach scraping has been addressed generally in Section 3.6.8 of this report and comments there remain relevant to this location. While soft management measures are always to be encouraged, they are unlikely to significantly alter the future risks to Manning Point and areas further south.

Advantages

- The problems facing Mitchells Island and Manning Point are clear and well understood.
- There is an opportunity to negotiate a long-term strategy with the community.
- The problem is easily monitored and the changes to the foreshore can be readily assessed and watched.

Disadvantages

- There is no simple solution to the problem as much of the Island and spit is likely to be rendered unusable over the next 100 years as dwellings, roads and infrastructure are affected.

3.9 Manning River Entrance

The relevance of the Manning River entrance works relate to the viability of Harrington and the use of the river and entrance. Options relate generally to the stabilising the entrance location, flooding, navigation, and maintenance of water quality in the inlet. The options are not specifically related to the open coast erosion and inundation issues to the south. The state of the entrance and any works to contain the entrance may impact on adjacent open beach areas along Manning Point Spit and particularly immediately south of the entrance where the spit is very narrow (50m) and at risk of breaking through.

Actions taken to manage the inlet (such as dredging or entrance training works) may from time to time make sand available for beach repairs (south of the entrance). Entrance behaviour can affect and/or increase the available sand supply to the north onto Harrington Beach following flooding or reduce the alongshore sand supply as the entrance shoals re-establish.

4 Consideration of Costs

4.1 Characteristics of Cost Estimates

The cost estimates presented herein are ball park estimates, prepared by us and based on our experience, the work of others, and published rates. They are subject to significant uncertainty and should not be considered highly accurate. If any of the options are pursued, a more detailed estimate should be sought when detailed design is occurring, closer to the time when construction or implementation is expected, so that expenditure can be more accurately forecast. At that stage, it may be warranted to seek the services of a qualified quantity surveyor, who can provide a certified cost estimate. We note, however, that the market for smaller projects, say less than $10M AUD, can be extremely volatile, dependent on overall demand within the marketplace at the time of tendering.

We have not included ongoing maintenance costs for works at this stage, although a likely maintenance requirement as a percentage of the capital cost is typically provided.

The estimates are reasonable for comparing different options at the planning stage.

4.2 Consideration of the Do Nothing Options

At the multi criteria assessment workshop (see Section 5), participants were presented initially with the do-nothing option for each of the key localities within the study area. The other management options presented in Section 3 were then outlined. Participants were then asked to score how well those management options compared to the "do-nothing" options.

To provide consistency herein, the do-nothing option is considered to have minimal cost, and the preliminary cost estimates discussed and provided in the following sections are therefore comparable to a baseline cost of $0.

4.3 Old Bar

4.3.1 Rock revetment wall (Lewis Street)

A reasonably detailed cost estimate for the rock revetment was prepared by Royal Haskoning DHV (2013). Aspects of this cost estimate (contingencies, design, supervision, environmental assessment, and inclusions in the cost estimate) have been replicated for other cost estimates, and much of the discussion in this section carries forwards to the analysis undertaken for the other management options. Details of the cost estimate are as summarised in Table 2. The costs are considered applicable to a 2013 timeframe. These need to be inflated to be more up to date. For our purposes, we have used the Heavy and Civil Engineering Construction index published by the

Australian Bureau of Statistics[1], projected forwards to around the end of 2025, using identical quarterly inflation values to those determined for the past year.

Table 2 Components of RHDHV Construction Cost Estimate (Lewis St Seawall, $AUD, 2013)

Item	Amount ($AUD)
Raw Construction Costs	**$6,061,300**
Core Construction Items (Earthworks and Rock Works)	$5,289,000
Sundry Items	$772,300
Contingency on Construction Cost (25%)	**$1,515,325**
DA Preparation and Environmental Assessment	**$200,000**
Design Development (3.5%)	**$265,200**
Tender Process	**$20,000**
Supervision/Contract Administration (3%)	**$227,300**
Total	**$8,289,125**
Adopt	**$8,290,000**

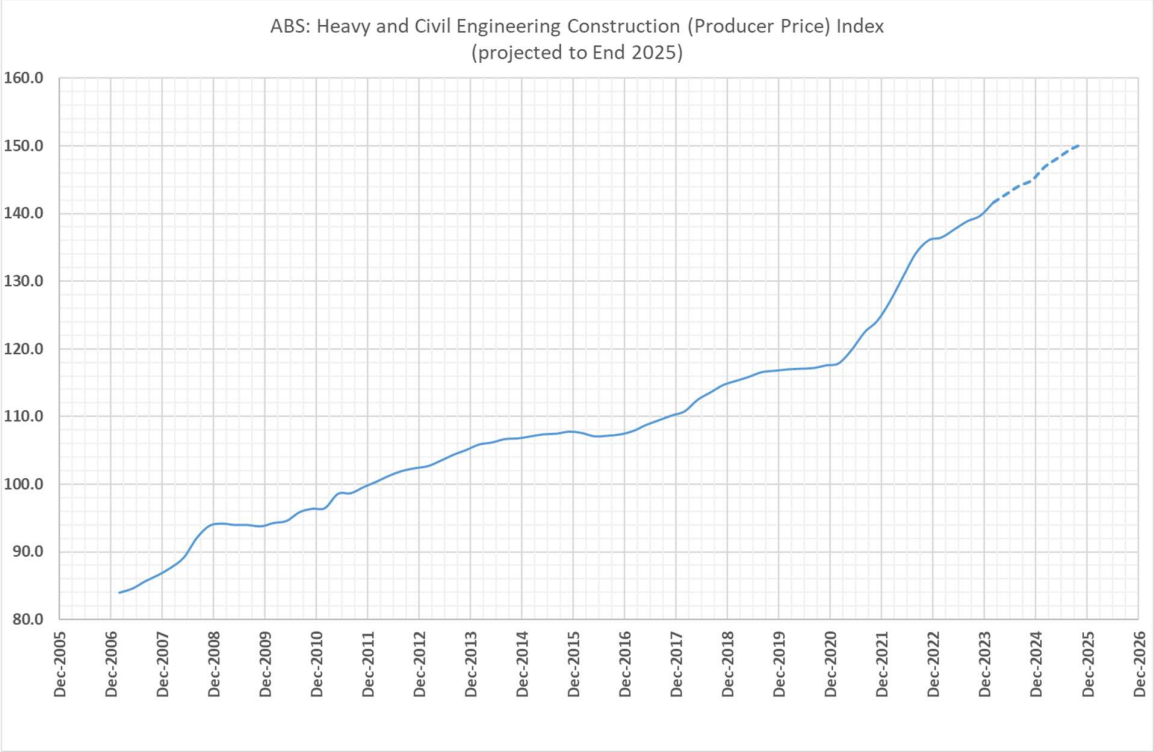

Figure 9 Adopted Inflation for Equilibrating Cost Estimates

[1] https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/producer-price-indexes-australia/latest-release

Considering Table 2, the following are relevant:

- Sundry construction activities (minor construction components and ancillary works, preconstruction survey, work as executed drawings, establishment and disestablishment, environmental control, protection and security of the works area) account for around 15% of the raw construction budget.
- The tender process to engage a contractor is likely to be similar for all management actions. Around 45% inflation is indicated between Mid-2013 and December 2025. and for this reason, the tender process is assumed to cost around $30,000 (c.f. $20,000.
- We consider that DA and Environmental Impact Assessment (EIA) would cost a minimum of $75,000 nowadays corresponding to a minimum of $50,000 back in 2013. The value would increase with size of the project. While $50,000 may have been adequate for a project of around $1M construction cost, any larger project would cost extra on a sliding scale. In 2013 numbers, we have assumed that the EIA cost is around $50,000 for the first $1M construction cost, with an additional $30,000 for every additional $1M in cost. Converting to numbers equivalent to the end of 2025, the cost of environmental impact assessment has been assessed as being $75,000 for the first $1.5M construction cost, with an additional $45,0000 for every additional $1.5M in cost.
- We have also added 6% to the overall cost for contractor's profit margin.

Noting these considerations, an inflated cost to the end of 2025 is estimated to be around $12,500,000 (presented in Table 3).

Table 3 Lewis St Seawall Rock Revetment Construction Cost Estimate ($AUD, inflated to end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$8,800,000
Contingency on Construction Cost (25%)	$2,200,000
DA Preparation and Environmental Assessment	$295,000
Design Development (3.5%)	$310,000
Tender Process	$30,000
Supervision/Contract Administration (3%)	$265,000
Profit	$530,000
Total	$12,430,000
Adopt	$12,500,000

A maintenance requirement of up to 2% per annum could be expected. Additional costs may be associated with the need to nourish the beach and treat end effects over time, and Royal Haskoning indicated that up to around 1000m^3 of sand may need to be provided per year.

4.3.2 Rock revetment wall (Pacific Parade)

A commensurate cost estimate was provided by Royal Haskoning DHV (2013) for the rock revetment seawall at Pacific Parade. This has been inflated using identical methods to those applied to the Lewis St seawall and the results are presented in Table 4.

Table 4 Pacific Parade Seawall Rock Revetment Construction Cost Estimate ($AUD, inflated to end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$7,500,000
Contingency on Construction Cost (25%)	$1,875,000
DA Preparation and Environmental Assessment	$255,000
Design Development (3.5%)	$262,500
Tender Process	$30,000
Supervision/Contract Administration (3%)	$225,000
Profit	$450,000
Total	$10,597,500
Adopt	$10,600,000

A maintenance requirement of up to 2% per annum could be expected. Additional costs may be associated with the need to nourish the beach and treat end effects over time, and Royal Haskoning indicated that up to around 1000m^3 of sand may need to be provided per year.

4.3.3 Submerged breakwater structure / multipurpose reef

There is great uncertainty surrounding what form a functional multipurpose reef (two were proposed initially) would take. The best proxy we presently have for recent construction of such a reef on the east coast of Australia is the structure recently constructed at Palm Beach in Queensland. While this structure has not been in place long enough to provide a definitive conclusion regarding its effectiveness in protecting against erosion, a cost of between $18 and $21M has been reported [2][3]. The Palm Beach

[2] https://www.brisbanetimes.com.au/national/queensland/palm-beach-gets-artificial-reef-in-gold-coast-budget-20160623-gpqkl3.html
[3] https://www.crucollective.com.au/blog/palm-beach-artificial-reef-completion/

structure is, reportedly, around 60,000m^3 in volume, whereas the two structures at Old Bar were expected to be around 30,000m^3. Conservatively a value of 40,000m^3 has been assumed here. Accordingly, being around 2/3 of the size of the Palm Beach structure in total, a construction cost of $14M AUD (mid 2019) has been adopted for this scheme. Subsequently, inflation consistent with Figure 9 (+30%) brings that cost up to around $18.2M ($AUD, End 2025). Additional cost components have been added as demonstrated in Table 5.

Table 5 Submerged Breakwater and Artificial Reef Construction Cost Estimate ($AUD, inflated to end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$18,200,000
Contingency on Construction Cost (25%)	$4,550,000
DA Preparation and Environmental Assessment	$576,000
Design Development (3.5%)	$637,000
Tender Process	$30,000
Supervision/Contract Administration (3%)	$546,000
Profit	$1,092,000
Total	$25,631,000
Adopt	$26,000,000

While an initial cost estimate of $7.2M was apparently derived in 2011, subsequent experience indicates that this is highly unlikely to have been a realistic cost estimate at the time. Combined with the apparent original underestimate, inflation now places an indicative cost at around $26.0M. This places the structure beyond the $20.0M limit established as discussed in Section 3.1. It seems exceedingly unlikely that this management option would be funded under a Coastal Management Program given the currently constrained funding environment for such works in NSW.

The maintenance requirement is uncertain. However, noting that the Narrowneck Artificial Reef on the Gold Coast was refurbished at a similar cost to the original construction, around 18 years after installation, it could be expected that maintenance of around 3 to 5% per annum would be required.

4.3.4 Geotextile Sand filled Container revetment (Lewis St and Pacific Parade)

We are unaware of this option being considered by others as a measure to be applied at Old Bar, and a preliminary cost estimate has been worked out from scratch. Herein, we have assumed that the more recently available "5.0"m^3 (actually 4.5m^3, weighing 9T when filled) ElcoRock ER500 GSC units would be used. We have also assumed that sand would be sourced locally from the beach. If sand needs to be brought in, the cost

would be around 50% higher. The ER500 units measure 3.35m long, by 2.3m high, by 0.8m high. Longevity and stability are uncertain, but stability can be improved markedly by placing the long axis of these bags perpendicular to the alignment of the wall. We have adopted, as a suitable end 2025, filled and placed, cost of $1,300 per GSC unit.

Based on a crest height of 6.2m AHD, and a toe elevation of -1.0m AHD, commensurate with the rock revetment designs, a structure which is 9 GSC units high would be needed. An additional toe GSC is included resulting in 10 GSC units in section. For estimation, each column of bags is 2.3m wide (alongshore, although stretcher bond placement is more likely). Over a length of 900m (Lewis St and Pacific Parade), this results in around 400 columns, or a total of 4000 bags. The construction of core elements of the wall, in terms of $AUD (end 2025), would be around $5.2M AUD. Allowing for sundry construction activities (15%), a cost of around $6.1M is expected.

Subsequent components have been added as demonstrated in Table 6.

Table 6 Geotextile Sand-filled Container Revetment ($AUD, inflated to end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$6,100,000
Contingency on Construction Cost (25%)	$1,525,000
DA Preparation and Environmental Assessment	$213,000
Design Development (3.5%)	$213,500
Tender Process	$30,000
Supervision/Contract Administration (3%)	$183,000
Profit	$366,000
Total	$8,630,500
Adopt	$8,630,000

The cost of this option compares favourably to that of the combined rock revetments, for protecting the same length of shoreline. However, it is still a substantial outlay for a structure which might be expected to have a life of between 10 to 15 years maximum. Structures from GSC's are commonly considered "Temporary" structures in New South Wales.

As a sensitivity test, the cost for building a less robust seawall from smaller containers ($2.5m^3$) and placing the containers with their long edge parallel to the beach has been assessed at around $6.0M Australian dollars.

It could be expected that maintenance of around 2 to 3% per annum would be required.

4.3.5 Rock filled bag revetment

The Kyowa Rock Bags (or filter unit) solution has also been considered. Based on correspondence with the Australian suppliers and consideration of conditions at the site, we have prepared a cost estimate based on the largest available 'S type' rock bags which have a more robust double weave and are designed for the "marine" environment. These also have the largest weight (8T) which is comparable to the weight of the larger GSC bags adopted for the previous option.

We note that there has been some physical modelling in Australia of the performance of 4T bags, which supported their use at Stockton Beach (Coghlan et al., 2022). However, questions remain relating to their performance in areas where waves are regularly breaking. Guidance published by Kyowa (the manufacturers, 2019), highlights limitations of these units for coastal protection concerning:

- The potential for large waves carrying stones to damage the net.
- The potential for damage to the net if the units are located where waves are breaking (i.e. in the surf zone).

Kyowa advise that the filter units are sometime used in Japan in the surf zone, but only temporarily and typically during an emergency.

For these reasons, we have adopted the stronger weave, larger weight 'S type' rock bag for this application. The bags have a diameter of 3.0m and are around 0.7m high. They would be placed in a 'stacked' (stair like) configuration, meaning that around 10 stacked units would be required to protect between -1.0m AHD and 6.2m AHD. An additional unit has been added for toe protection.

Therefore 11 bags will protect around 3m of the foreshore. Based on rates derived from information given to us by the Australian supplier, and inflation to the end of 2025, we estimate that each of the bags would cost around $3,200 to supply, fill with rock and place on site. This equates to around $11,750 per metre of beach protected. Allowing for sundry construction items, this a per m rate of $13,500 is likely over 900m, this results in a cost of around $12.15M.

Subsequent components have been added as demonstrated in Table 7. The estimated cost associated with the structure is around 3/4 that of providing a full, engineered rock revetment.

It could be expected that maintenance of around 2 to 3% per annum would be required.

Table 7 Rock-filled Bag Revetment ($AUD, inflated to end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$12,150,000
Contingency on Construction Cost (25%)	$3,037,500
DA Preparation and Environmental Assessment	$394,500
Design Development (3.5%)	$425,250
Tender Process	$30,000
Supervision/Contract Administration (3%)	$364,500
Profit	$729,000
Total	$17,130,750
Adopt	$17,150,000

4.3.6 Property Purchase

It is very difficult to predict how the property market will respond to coastal erosion and sea-level rise. Certainly, at several well publicised and notable erosion 'hot spots' in New South Wales, that knowledge does not yet seem to have caused a fall in property prices. Indeed, record sales have been experienced at several of these locations over the past 5-8 years, sometimes very soon after significant erosion events.

However, it is difficult to imagine that these properties will retain value once the land has been substantially lost to the sea and any residence is severely damaged or completely lost.

To assist with analysis, data from the NSW Valuer General's property sales page[4] was downloaded for both Pacific Parade and Lewis Street, for 2001 through to the present. The sales included in the analysis were limited to beachfront properties, namely even numbered addresses on Lewis St and all properties on Pacific Parade. The sales were divided by the plan area of the property to remove any distortion from lot size. A chart showing the outcome is presented in Figure 10. From that chart, the following can be noted:

- The pattern of sales values is scattered and testing with fits of various trends did not provide a convincing relationship.
- This may have been substantially influenced by some notable large values since 2021.
- However, there has been a clear growth in property sales values, even if that has been erratic.

[4] https://www.valuergeneral.nsw.gov.au/land_values/where_can_you_learn_more_about_your_land_value/property_sales

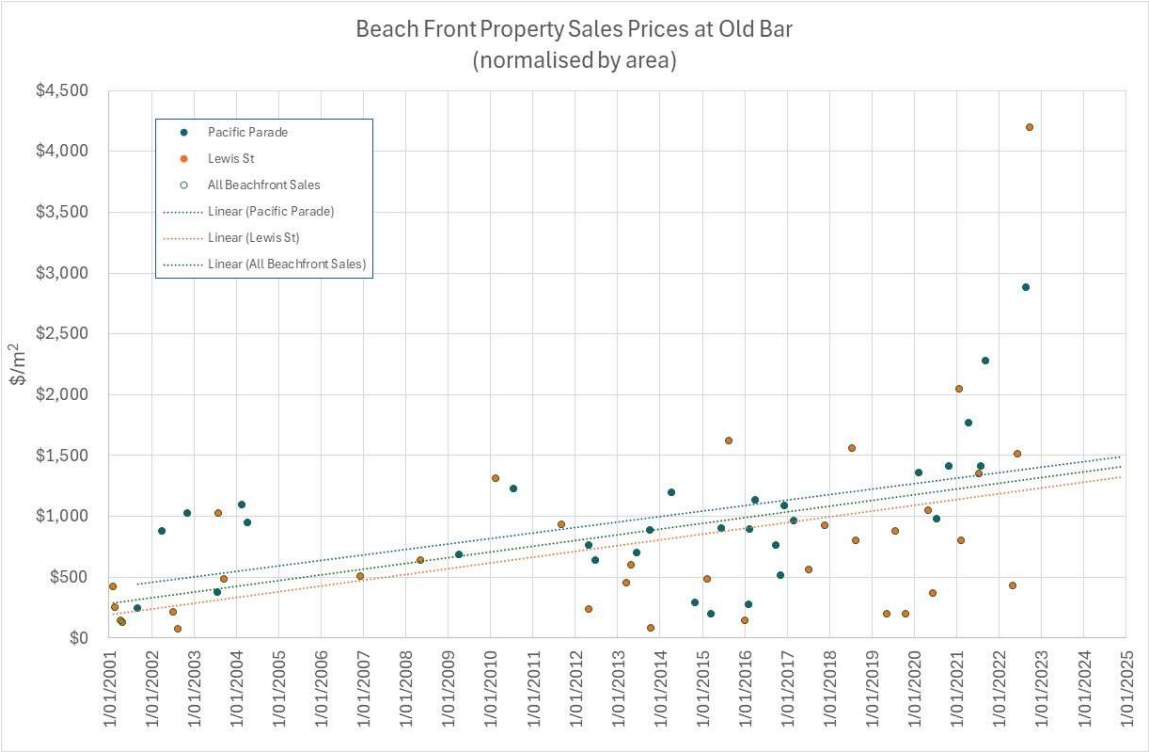

Figure 10 Normalised Beachfront Property Sales at Old Bar, 2001 through 2024

For the present analysis, a value of \$1,500/m² at the end of 2025 has been adopted. The total area was estimated by digitising around the residential lots in GIS, resulting in the values in Table 8.

Table 8 Estimated Total Value of Beachfront Property, Lewis St and Pacific Parade, Old Bar (end 2025)

Location	Area (m²)	Total Value
Lewis St	43850	\$65,775,000
Pacific Parade	13910	\$20,865,000

The estimated value of the beachfront property at Old Bar, if it were to be purchased at market value by the end of 2025 is close to \$90M.

4.3.7 Beach scraping

It is very difficult to project how much beach scraping might be required to recover from storms in coming decades. It will be required sporadically in response to storms.

A set of hazard lines (or zones) was provided to us by Council. Overall, these indicate a 50% chance that the zone of reduced foundation capacity (ZRFC) will recede by around 60m between 2020 and 2060 at Old Bar.

Herein, we have assumed that, to counter this, it will be necessary to scrape an equivalent volume to that lost over this period, with an expectation that the average rate per year will increase over time. Over the full period considered, the beach dune scarp would recede 1.5 metres per year. The scarp is assumed to be 6.2m high and 900m long. The recession will not occur evenly, this assumption is a simple approximation.

Each year, an estimated average of 8,300m^3 would need to be relocated from the swash zone to the eroding scarp at the back of the beach, following storms. While the per cubic metre cost for an operation such as this will vary greatly depending on the scale of the required sand movement, a value of around $10-12 per m^3 is a reasonable first estimate of potential costs for completing the operation. Per year, the cost for works could be expected to be $100,000, on average.

Table 9 Typical Beach Scraping Campaign Cost for an Annual Campaign at Old Bar ($AUD, inflated to end 2025)

Item	Amount ($AUD/yr average)
Raw Construction Costs	$100,000
Contingency on Construction Cost (25%)	$25,000
DA Preparation and Environmental Assessment	$10,000
Design Development (3.5%)	$3,500
Tender Process	$5,000
Supervision/Contract Administration (3%)	$3,000
Profit	$6,000
Total	$152,500
Adopt	$150,000

Compared to other options, beach scraping may be far more economical in the short term, particularly if the intention is to buy time to work out an appropriate pathway for adaptation (as per the following section). However, this is not an option which genuinely provides protection in the long term. Any properties that are currently threatened by coastal erosion will continue to be threatened, and a large enough storm may well result in substantial beach loss and damage to property. Costs may vary widely from year to year.

4.3.8 Flexible adaptation (including Managed Retreat)

The costs presented herein relate to the co-development of a local adaptation plan (LAP) with the community. The costs associated with eventual delivery of actions within the developed plan, and their timing, is highly uncertain and cannot be

determined at this stage. The actions may well include elements of the other options discussed in this report.

It may be that Council would aim to develop the LAP during the first 5 years of the CMP, followed by CMP review and the inclusion of some actions during the second five years. Funding for part of the LAP development (external consultants) would typically be available from the NSW Coast and Estuary Grants program (on a 2:1 State: Council basis), but substantial internal effort is also required from Council staff. Opportunities are also arising through the process being administered by the NSW Reconstruction Authority via the recently released State Disaster Management Plan, and alternative funding sources may become available with time.

The cost estimate has been developed considering Old Bar in the first instance, as this is the location where action is more critically required. The estimates are based on discussions with staff from Lake Macquarie City Council, which has developed several LAPs for areas fringing Lake Macquarie over the past 15 years. While the nature of the hazard differs (i.e. inundation around Lake Macquarie, vs. erosion at Old Bar), the process to be followed is similar. Adjustments have been made considering recent inflation and the increased cost of external consultancies, the difference in scale (i.e. size of community with which to engage), and the existing availability of suitable underpinning hazard strategies.

The process followed assumes a best practice co-development of the LAP as a partnership with the community, following the Dynamic Adaptation Policy Pathways (DAPP) framework, which has emerged as an internationally preferred methodology for tackling the deep uncertainty associated with climate change and sea-level rise over the past decade (Haasnoot et al., 2013; Lawrence et al., 2019; Twyford and Twyford, 2012).

We estimate that:

- Around $100,000 would be spent on external consultancies annually, on average, over the next five years, with a variety of skills contracted in, but heavily focussed on communications and simplifying technical information for consideration by the community.
- An (approximately) equivalent amount of internal council resources dedicated to driving promoting and coordinating the process, including presentations, workshops and the formal development of the LAP. This effort would typically involve approximately 0.8 to 1.0 full-time equivalent (FTE) staff time.

In this instance, no contingency has been added, although some variability from year to year could be expected.

4.4 Farquhar Inlet

4.4.1 Dredging to keep entrance open

In the description of this option, Worley Parsons (2010b) assumed that a permanent "mini-dredge" with a crew of four workers would operate to keep the entrance open all the time. The economic viability of this option seems to have hinged on a permanent dredger being continuously active at many sites on the Manning River. We are aware of this type of "permanent dredger" idea being postulated for different locations in NSW, including sharing between estuaries, but at the present time it seems that this is simply not an economical proposition.

We are also unclear on the way in which Worley Parsons estimated the volumes of sediment requiring removal. However, they assumed that around 45,000m^3 (35 days at ~1225m^3/day) would be removed in the first year, with around 30,000m^3 (25 days) of maintenance dredging required every year after that.

Herein, we have assumed that the base cost for mobilisation and demobilisation of the dredger would be around $100,000 each which is an appropriate ball park figure based on recent experience in NSW while noting that this can vary significantly. Similarly, a per m^3 rate for dredging and pumping dredged spoil is typically between $10 to $30/$m^3$, but is extremely volatile in NSW, dependent on several factors including the size of the campaign and other complexities. We understand that, due to the present nature of the market, rates above $40/$m^3$ have been paid on recent contracts of a scale similar to that proposed by Worley Parsons. A rate of $30/$m^3$ has been adopted, but the volatility of pricing for dredging in NSW needs to be considered carefully.

The resulting costs are considerable, for example, if considered over a 20-year period, total outlay would be around 32 – 33M $AUD.

Table 10 Indicative Dredging Campaign Cost for an Initial Dredging Campaign at Farquhar Inlet ($AUD, inflated to end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$1,550,000
Contingency on Construction Cost (25%)	$387,500
DA Preparation and Environmental Assessment	$76,500
Design Development (3.5%)	$54,250
Tender Process	$30,000
Supervision/Contract Administration (3%)	$46,500
Profit	$93,000
Total	$2,237,750
Adopt	$2,250,000

Table 11 Indicative Dredging Campaign Cost for Annual Dredging Campaign at Farquhar Inlet ($AUD, inflated to end 2025)

Item	Amount ($AUD/yr average)
Raw Construction Costs	$1,100,000
Contingency on Construction Cost (25%)	$275,000
DA Preparation and Environmental Assessment	$63,000
Design Development (3.5%)	$38,500
Tender Process	$30,000
Supervision/Contract Administration (3%)	$33,000
Profit	$66,000
Total	$1,605,500
Adopt	$1,600,000

4.4.2 Dredging and training structures

While variations on a trained entrance were considered by Worley Parsons, the option comprising the following has been costed:

1 Dredging works to create and maintain an entrance along the existing "soft rocks" at the southern edge of Farquhar Inlet, north of Old Bar.

2 Combine the dredging with construction of training walls and breakwaters using a combination of geofabric "Mega Containers" and 250m of rock armour training wall and breakwater.

Again, we have taken quantities from those assessed by Worley Parsons. The base construction involves:

- 30,000m^3 of dredging, and the cost of mobilisation and demobilisation.
- Supply and delivery of 10 Mega Containers.
- Dredging of 18000m^3 as part of an operation to fill the Mega Containers.
- Rock Supply and placement 13,800 Tonnes.

The costs have been adjusted to maintain consistency with the other cost estimates contained herein.

Table 12 Indicative Capital Cost for Dredging and Installation of Hybrid Mega Container / Rock Armour Training Structures ($AUD, inflated to end 2025)

Item	Amount ($AUD/yr average)
Raw Construction Costs	$5,900,000
Contingency on Construction Cost (25%)	$1,475,000
DA Preparation and Environmental Assessment	$207,000
Design Development (3.5%)	$206,500
Tender Process	$30,000
Supervision/Contract Administration (3%)	$177,000
Profit	$354,000
Total	$8,349,500
Adopt	$8,500,000

At first glance, the cost estimate in Table 12 seems low for twin training structures on the open coast in NSW. Considering information provided in Worley Parsons (2010b) we note that:

- The end of the structures does not extend far beyond the beach face shown in the figure illustrating this option within the Worley Parsons report. Considering the location of offshore bars, we expect that the structures would need to extend at least an extra 250m out into the surf zone to be effective.
- As the structure extends further into deeper water, the amount of material (rock, geotextile containers) required in the cross section increases in a non-linear manner.

We consider that the two structures are likely to cost more than 4 times the amount shown in Table 12, if the intention is to genuinely keep the entrance open and to effectively train flows.

We do also note that the ongoing maintenance costs, over 30 years as outlined in Worley Parson's cost estimates, are around twice the amount of the capital costs. It may be that much of this is related to the need for ongoing dredging borne by the structures not extending into deep enough water, and therefore being more likely to allow the entrance to infill with sand.

Overall, we consider it likely that at least $40M, and probably significantly more, capital costs would be required to build genuinely functional breakwaters at this location. It is beyond the scope of the present study to undertake the spatial analysis and modelling required to provide a more definite of the quantities of required materials to improve this estimate.

4.4.3 Dredging to form Lake behind closed beach berm

The costing structure for this option uses the same information as the dredging to keep a continuous entrance option discussed in Section 4.4.1. In this instance, however, the option calls for a once-off removal of 200,000m^3 of sand. The resulting cost estimate is outlined in Table 13. The amount estimated would be an extraordinary outlay for a management option which has seeming little benefit (Section 3.7.4).

Table 13 Estimated Cost for Once off Dredging to Create Lake behind Barrier at Farquhar Inlet ($AUD at end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$6,200,000
Contingency on Construction Cost (25%)	$1,550,000
DA Preparation and Environmental Assessment	$216,000
Design Development (3.5%)	$217,000
Tender Process	$30,000
Supervision/Contract Administration (3%)	$186,000
Profit	$372,000
Total	$8,771,000
Adopt	$8,800,000

4.5 Mitchells Island and Manning Point

4.5.1 Manage Mitchell Island foreshores with "soft" options.

This option, and the next, are very similar, although they vary in terms of the location to be treated and focus. Even with soft options, efforts to recover from erosion along a discrete length of the coastline is fraught with difficulty. Generally, effective scraping, nourishment and dune recovery needs to either be in relatively protected areas, or to cover an entire coastal compartment, otherwise there will be an ongoing trend for the sand to be transported alongshore to adjacent areas, with the alignment of the foreshore 'smoothing' out to remove any irregularity that may have been introduced by a nourishment or rehabilitation activities.

Accordingly, we have assumed that up to twice the length of foreshore to be protected will need to be treated, as an attempt to provide more longevity to any works that are undertaken. This is particularly important for beach nourishment. In comparison, beach scraping is a short-term repair measure which targets eroded sections immediately following a storm.

For the "Mitchell Island" area, we've considered a length of coastline which extends from the southern extent of the settled area around Manning Point township, to the southern extent of the cleared area around the Manning Point Wastewater Treatment Plant – around 1200m. Further south, there is limited infrastructure, between here and the Farquhar entrance of the Manning River.

While nourishment can focus on the beach face, consideration of the entire active beach profile is normally required. In addition to considering the alongshore extent, the depth of the active profile to be nourished needs to be considered. Bathymetric data were downloaded from the Elvis website [5] and interrogated to determine an appropriate active depth to which nourishment should be carried out. Cursory inspection of shore normal profiles from that data indicate that the profile may be reasonably active up to a depth of around 8m, and occasionally active up to a depth of 15m. This does not preclude mobilisation of sand even further offshore during rare storms. Nourishment out to a 'nominal' contour of -12.5m AHD, has been assumed, around 700m offshore.

The amount of sand to be imported would theoretically replace sand which had already been lost. In estimating this, we note that the shoreline has been receding here by around a metre per year since the late 1980's and that the offshore slope of the underwater profile is around 1V:60H. The movement of the shoreline is equivalent to adding 2cm to the underwater profile every year (taken from the beach face and dune). To undertake broad scale nourishment to counter the movement of 20 years would

[5] https://elevation.fsdf.org.au/

require acquisition of some 700,000m^3 of sand. Noting that this would probably need to be sourced externally from the beach compartment, it is highly likely that transport costs would be substantial and the cost for dredging at depth, transporting and then placing in the nearshore zone by rainbowing from specialist dredging equipment may well be around \$50/m^3.

A base fee for this large-scale nourishment campaign would likely be in the vicinity of \$32M AUD with additional costs as outlined in Table 14.

Table 14 Estimated Cost for Large Nourishment Campaign at Northern Mitchell's Island (\$AUD at end 2025)

Item	Amount (\$AUD)
Raw Construction Costs	\$32,000,000
Contingency on Construction Cost (25%)	\$8,000,000
DA Preparation and Environmental Assessment	\$990,000
Design Development (3.5%)	\$1,120,000
Tender Process	\$30,000
Supervision/Contract Administration (3%)	\$960,000
Profit	\$1,920,000
Total	\$45,020,000
Adopt	\$45,000,000

The cost for beach scraping has been calculated using the same assumptions discussed in Section 4.3.7. A recession of around 50m is expected between 2040 and 2060 (average 1.25m per year), based on the available hazard lines. The dune crest is typically at 8m AHD. Assuming scraping to rebuild 1.25m dune width by a height of 8m and a shoreline length of 1200m, results in around 12,000m^3 requiring relocation from the beach face to the base of the dune, annually. This equates to a base cost of around \$140,000 per year. Considering other factors, around \$210,000 per year may expected to be outlaid annually.

An approach could be adopted whereby beach scraping is adopted until it becomes untenable (too frequent, unable to mitigate against rampant recession) at which stage a large nourishment campaign might be considered if other management strategies have not been adopted. However, at present, large nourishment operations are uncommon in NSW, and it may take time for the market for these types of works to mature. The cost for such a campaign may also reduce over time.

Table 15 Typical Beach Scraping Campaign Cost for an Annual Campaign at Mitchells Island ($AUD, inflated to end 2025)

Item	Amount ($AUD/yr average)
Raw Construction Costs	$140,000
Contingency on Construction Cost (25%)	$35,000
DA Preparation and Environmental Assessment	$10,000
Design Development (3.5%)	$4,900
Tender Process	$5,000
Supervision/Contract Administration (3%)	$4,200
Profit	$8,400
Total	$207,500
Adopt	$210,000

4.5.2 Manning Point: Beach scraping, Nourishment, and Dune Management

At Manning Point the options are similar to Mitchell's Island and may well be carried out in tandem, by joining the two lengths of beach together. The length considered here extends from the southern extents of the Manning Point settlement, north to beyond the narrowest point on the spit close to the Harrington Entrance of the Manning River, a distance of some 1900m.

If a large dredging and nourishment campaign were undertaken here, it would be sensible to complete this in conjunction with that suggested for Mitchell's Island, to make take advantage of economies of scale. A complete nourishment campaign (covering 4300m along the coast), would require the import of some 1,200,000m^3 of sand at a base cost of around $55M AUD. Considering other factors, the ultimate cost could be around $80M.

The cost for beach scraping has been calculated using the same assumptions discussed as for Mitchell Island in the preceding section. A recession of around 50m is expected between 2020 and 2060 (average 1.25m per year), based on the available hazard lines although this is complicated by the dynamics of the spit north of Manning Point. If there is a breakthrough of that spit, the behaviour of the entrance and adjacent beach becomes very uncertain.

The dune crest is typically at 9m AHD. Assuming 1.25m by a height of 9m by a shoreline length of 1900m, results in around 22,000m^3 requiring relocation from the beach face to the base of the dune, annually. This equates to around $250,000 per year. Considering other factors, an outlay of around $360,000 per year (on average) may be required for beach scraping at Manning Point if ongoing recession here is to be

mitigated or slowed. We note that there remains a buffer of dune vegetation between the beach and Manning Point. The most critical location at present seems to be that location where the spit is narrowest and coastal or riverine processes could foreseeably breakthrough during a flood or coastal storm event.

Table 16 Estimated Cost for Large Nourishment Campaign at Manning Point and Northern Mitchell's Island ($AUD at end 2025)

Item	Amount ($AUD)
Raw Construction Costs	$55,000,000
Contingency on Construction Cost (25%)	$13,750,000
DA Preparation and Environmental Assessment	$1,680,000
Design Development (3.5%)	$1,925,000
Tender Process	$30,000
Supervision/Contract Administration (3%)	$1,650,000
Profit	$3,300,000
Total	$77,335,000
Adopt	$80,000,000

Table 17 Typical Beach Scraping Campaign Cost for an Annual Campaign at Manning Point ($AUD, inflated to end 2025)

Item	Amount ($AUD/yr average)
Raw Construction Costs	$250,000
Contingency on Construction Cost (25%)	$62,500
DA Preparation and Environmental Assessment	$10,000
Design Development (3.5%)	$8,750
Tender Process	$5,000
Supervision/Contract Administration (3%)	$7,500
Profit	$15,000
Total	$358,750
Adopt	$360,000

Dune restoration works, including any fencing and planting would focus on the coastline adjacent to Manning Point and will target the immediate areas of concern. Unfortunately, on a receding coastline, any dune revegetation works will eventually be lost to the sea. However, combined with scraping and nourishment activities, dune restoration may prove to have an acceptable longevity.

We have assumed that a 1km length of coast, between the northern and southern pedestrian accessways would be maintained, with operations occurring around once every 5 years.

Over that time, around 6.5m of dune width may need to be replanted (average of 6,500m^2/yr. An all-inclusive rate for planting, maintenance and ongoing weeding could be up to \$20/m^2. Around 1km of post and wire dune fencing at the rear of the foredune could be installed for around \$20/m. A total outlay of \$220,000 could be expected if a commercial contractor is used. If volunteer labour is used, the fee could be reduced substantially.

Table 18 Dune Revegetation Campaign-Manning Point (~Once every 5 years)

Item	Amount ($AUD/yr average)
Raw Construction Costs	$150,000
Contingency on Construction Cost (25%)	$37,500
DA Preparation and Environmental Assessment	$10,000
Design Development (3.5%)	$5,250
Tender Process	$5,000
Supervision/Contract Administration (3%)	$4,500
Profit	$9,000
Total	$221,250
Adopt	$220,000

5 Multi Criteria Assessment

A multi-criteria assessment (MCA) was completed to assess the management options described in Section 3. The technique involves averaging the informed but somewhat subjective scores of a group of stakeholders against a range of criteria for each management option.

The scoring for the MCA was completed by project stakeholders, following an explanatory workshop held on 21 May 2024.

We note that the MCA scoring procedure is imprecise, qualitative, and subjective, and that all participants have certain biases, different levels of understanding and differing priorities. If everyone was perfectly informed, and behaved in a perfectly rational manner without bias, then there would be no variation in scores. However, we consider that the results provide a valid input to decision making and comprise a reasonable way of comparing expected performance of different options when considering the combined values of the pool of stakeholders that participate.

Noting limitations, the approach we take is relatively simple, but also geared towards avoiding attempts to "game" the outcome. This is achieved by requiring two sets of scores, namely:

- Scoring of the importance of different criteria, and
- Scoring the performance of options against different criteria.

We consider that the criteria weighted performance scoring adopted in our assessment achieves a suitable balance between complexity while remaining transparent. MCA calculations can be overly complicated, resulting in a complexity which belies the underlying subjectivity inherent in the method.

5.1 Identification of Criteria

5.1.1 Broad Criteria and Consistency with the Coastal Management Manual

One way to consider option assessment is against the three broad criteria outlined in the Coastal Management Manual (CMM, NSW Government, 2018b), namely: feasibility (*"Would it work?"),* viability *("Is it worth paying for, and is there a fair way to pay for it?"*), and acceptability *("Will stakeholders and the public like the option and is it equitable?"*). The CMM promotes a process whereby management actions are assessed against these three criteria as a set of serial 'gates':

1. Assess if the action is *feasible*.
2. If the action is feasible, assess whether it is *viable*.
3. If the action is viable, assess whether it is *acceptable*.

The intention of the CMM method is that, if an action passes through the three gates of assessment, the action should be included in the CMP.

In practice, the way in which a CMP is typically developed, and the variable nature of the funding environment for coastal management in NSW, means that this process cannot be cleanly adopted. Viability is typically only clear during the later stages of CMP development, towards the end of Stage 3, and throughout Stage 4 when negotiations occur with stakeholders regarding their willingness to pay for different options.

What often happens is that there are several actions that are *"feasible"*, *"acceptable"* and worth paying for (i.e., make sense in terms of economic "efficiency"). However, there is no valid identifiable funding mechanism, due to limitations on stakeholder budgets.

One approach being adopted by some Councils is to treat those un-fundable, but otherwise acceptable options as "orphan actions". They will be taken out of the formal CMP document and presented in an appendix as options that are worth pursuing if a suitable funding opportunity arises in future. However, being taken out of the CMP and its business plan means that some contestable funding sources cannot be accessed for those orphan actions, with an example being the current DCCEEW *Coast and Estuaries Grants* scheme.

The study brief for this project requested a slightly different set of broad criteria, wherein aspects of *Viability* (renamed "Affordability") and *Acceptability* are now considered under a separate criterion *"Fairness"*.

- **Feasibility:** Can the action be reasonably undertaken.
- **Affordability:** Is the intervention affordable (construction, establishment, and maintenance costs).
- **Acceptability:** Is the action likely to be acceptable to the immediate and broader MidCoast community.
- **Fairness:** Does the intervention impose unreasonable obligations on the immediate and broader community and future generations.

These both overlap and remain consistent with the three broad criteria from the CMM. The separation of Fairness for separate consideration has a key advantage. The stakeholders and decision makers who ultimately determine the management actions to be included in a CMP tend to have a direct and current interest in the issues that need to be managed. However, there are important stakeholders that won't be involved in decision making, such as:

- Ratepayers and taxpayers from outside the coastal zone being considered, who may not benefit directly from the action yet are required to indirectly pay for it.

- Future generations. For example, noting that some management actions may place an unfair future burden of maintenance or management, or maladaptation to climate change which may prove more expensive in future. Similarly, there is an issue with unduly delaying action, exposing future generations to potential harm and more expense. For example, a situation may arise where coastal hazards are managed reactively as emergencies arise, instead of taking a strategic and measured approach. Reactive management is likely to be expensive and the risk of implementing maladaptive management options in a rush is heightened.

The detailed criteria discussed in the following section have been categorised against the four broad criteria specified by MidCoast Council, except for affordability. Costs for different options have been considered separately, as discussed in Section 4. Considering this, none of the criteria within our final list refer to affordability and participants in the MCA workshop were advised to not consider cost as a factor when deliberating and scoring. Affordability is considered separately in our combined assessment (Section 6).

5.1.2 Identification of Criteria for MCA.

The identification of appropriate criteria within NSW's coastal management framework is complicated by there being multiple valid potential sources for those criteria. Several different sources have been considered in this study with raw lists of criteria reworded, combined, and rationalised into the final list of criteria adopted for the assessment. The sources considered are:

- The objects of the CM Act.
- The objectives for all four coastal management areas from the CM Act.
- Text from the CMM outlining what constitutes a 'feasible' action[6].
- Text from the CMM outlining what constitutes an 'acceptable' action[7].
- The outcomes of Community Consultation completed in association with this study (refer to Appendix C).
- A Draft Issues and Management Paper provided to the Study Team by MidCoast Council (Mid Coast Council, 2023).
- The Draft Scoping Study for the MidCoast Coastline (Mid Coast Council, 2020).

The final list of detailed criteria is presented in Appendix A1, and the source list of criteria, cross referenced to the final list as appropriate, are presented in Appendix A2.

[6] p43 of Part B, Stage 3 of the CMM (NSW Government, 2018b)
[7] p46 of Part B, Stage 3 of the CMM (NSW Government, 2018b)

The final criteria have been worded with the aim of being suitable for consideration by stakeholders with broadly varying levels of understanding. We have tended towards simplifying the language wherever relevant.

A draft of this section of the report and Appendix A were provided to MidCoast Council staff prior to the workshop and scoring exercise, and some minor modifications were made. The final listing and sorting of options is presented in Appendix A.

5.2 Method of Multi Criteria Assessment

The MCA workshop was attended by 15 community members recruited from an open, expression of interest request. Furthermore, representatives from DCCEEW, NPWS, Crown Lands, Coastcare, the Local Aboriginal Land Council, and the Old Bar Manning Point Business and Community Association attended and participated in the scoring. In addition, three study team members scored the options as well. Neither Council staff, nor Councillors took part in the scoring activity. In total 25 sets of scores were returned and used in the analysis.

All participants were provided with the list of adopted criteria and a description of those criteria prior to the workshop on 21 May 2024 and asked to weight those criteria as part of the Step 1.

During the first step, the final criteria were scored by stakeholders with values between 0 and 10 indicating a degree of importance. Herein, 0 indicated negligible importance and 10 indicated critical importance.

During the second step, stakeholders scored the performance of management options against the criteria. Participants assigned scores of -4 to +4. Herein, -4 represented a critically negative impact and 4 represented an outstandingly positive impact. A value of zero could either represent negligible impact or irrelevance with relation to that criterion.

The criteria importance scores provided by each stakeholder were averaged, as were the scores for each option at each site. For each management option, the averaged criteria importance score was multiplied by the averaged (across all stakeholders) score against that criterion. The numbers were then totalled (across all criteria) to give a final score for each option. As a final step, the total scores were normalised, with the most positive score assigned a value of +100 and all other scores scaled accordingly. This final step is intended to make comparison between options simpler and to highlight that the MCA score is for comparison purposes only and that the absolute value of the actual scores does not have any relevance. It is the comparative differences between the scores that matters. Options were also ranked against each other for each site (i.e. 8 options for Old Bar).

Full details of the calculation are presented in Appendix B, including more granular consideration of how different options scored and ranked between different groups (study team, agencies/stakeholders, community), and against the different types of criteria (Acceptability, Fairness, Feasibility). This more granular analysis may be of use in justifying/selecting options to pursue in the CMP but is not discussed in detail within the following sections.

We note that the MCA scoring procedure is imprecise and qualitative, and that all participants have certain biases, different levels of understanding, and differing priorities. However, it is considered that the results are valid and comprise a reasonable way of comparing expected performance of different options when considering the combined values of the pool of stakeholders.

5.3 Outcomes of Multi Criteria Assessment

As noted above numbers provided by respondents to the multi criteria assessment were used to calculate average importance level scores across all 18 criteria. The detailed analysis in Appendix B breaks this down for three categories of respondents:

- Community/Unnamed participants,
- Agencies/The Study Team
- All Respondents.

The 'scores' against each of the criteria were also averaged for these groups.

These weighted average scores for each management option were then determined by multiplying the average importance level score by the average score for each criterion.

The weighted average scores for each category of criterion (Acceptability, Fairness, Feasibility and Total). Results are presented as normalized values, giving the highest-ranking composite score a value of 100 and scaling all other scores against it. For example, Old Bar Option 9 (Flexible Adaptation) was the best performing option for Old Bar, and had a raw, composite score of 318.37 (considering all criteria and all respondents). In comparison, Old Bar Option 7 (Second Best Option) had a score of 141.1. Option 9 was scaled to a value of 100 and Option 7 to 44.

Finally, options were ranked considering their MCA scores. The normalized scores and rankings for the Old Bar options, and the Farquhar Inlet to Manning Point options are presented in Table 19 and Table 20 respectively.

Table 19 MCA Summary Results for Old Bar Management Options – All Respondents

	Acceptability Criteria		Fairness Criteria		Feasibility Criteria		All Criteria	
Option	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**
Old Bar 2 Lewis St Rock Revetment	10	6	-7	6	23	5	9	6
Old Bar 3 Pacific Parade Rock Revetment	16	5	1	5	19	6	13	5
Old Bar 4 Submerged Breakwater / Multipurpose Reef	-1	7	-22	8	-52	8	-20	8
Old Bar 5 GSC Container Wall	17	4	5	4	31	2	18	4
Old Bar 6 Rock Filled Bag Revetment	-4	8	-20	7	-3	7	-8	7
Old Bar 7 Property Purchase	53	2	43	2	31	2	44	2
Old Bar 8 Beach Scraping	32	3	38	3	31	2	33	3
Old Bar 9 Flexible Adaptation (including managed retreat)	100	1	100	1	100	1	100	1

Table 20 MCA Summary Results for Farquhar Inlet to Manning Point Management Options

	Acceptability Criteria		Fairness Criteria		Feasibility Criteria		All Criteria	
Option	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**
Farquhar Inlet 2 – Dredging to keep entrance open.	8	3	12	3	9	3	9	3
Farquhar Inlet 3– dredging and training structures	-34	4	-46	4	-90	4	-51	4
Farquhar Inlet 4– Dredge to form Lake behind Berm	-114	5	-125	5	-197	5	-137	5
Mitchell's Island – Soft options	68	2	66	2	80	2	70	2
Manning Point – Soft options	100	1	100	1	100	1	100	1

For brevity, we have not provided the breakdown for different groups of respondents (see Appendix B for more detail). However, for the Old Bar Options, there is general cohesiveness across results produced by the Community and the Agencies/Study Team and rankings are similar. This is not the case for Option 8 (Beach Scraping) where community participants ranked it 6th for feasibility but the Agencies/ Study Team group ranked it as number 1. Option 8 and Option 7 (Property Purchase) both consistently ranked highly with Option 4 (Submerged Breakwater/Reef) and Option 6 (Rock Filled Bag Revetment) receiving the lowest ranks across all criteria and groups.

When looking at management options for Farquhar, Mitchells Island and Manning Point Farquhar Option 4 (Dredging to form lake behind closed beach berm) was not considered positively by Community or Agencies/Study Team members. Manning Point Option 2 (Beach Scraping, Nourishment and Dune Management) was seen as a highly acceptable option whilst also being feasible and fair ranking highly by both groups. Similarly, Mitchells Island Option 2 ('Soft' Foreshore Options) scored positive overall.

6 Combined Assessment of Management Options

6.1 Outcomes of Community Consultation

An important part of this commission was the completion of community survey activities and consolidation of the outcomes of those activities with consultation undertaken by Council via its "Have your Say" website between November 2023 and February 2024. That earlier consultation allowed community members to provide input on management options, values and coastal usage via a geotagged mapping interface.

The community engagement activities completed as part of this study took place between March and April 2024. These efforts were coordinated by Spectrum Comms, under the guidance of Salients and Council, and targeted the collection of community input on values, coastal usage, and preferences for various management strategies. As part of this later consultation, Micromex conducted an independent community survey between March 11 to March 31, 2024, engaging 85 respondents from across the MidCoast Local Government Area.

The findings reveal a deep appreciation for the beauty and relatively pristine condition of the coastline, with walking, beach swimming, fishing, and dog walking emerging as the most popular activities. Community members expressed concerns regarding the management of 4WD access, the maintenance of pedestrian access and the improvement of public amenities. Accordingly, the broader community strongly values access to the beach and along the beach.

Survey respondents were presented with four broad management categories: "*taking no action*", "*managed retreat*", "*short-term solutions*", and "*long-term options*". Among these, the community showed a clear preference for long-term options, reflecting their desire for a clear and definite solution to ongoing erosion of the shoreline. It is important to recognise that survey recipients had a limited introduction to the background of different management options, and it seems likely that the phrase "long-term option" was interpreted as meaning a protective structure that would be somewhat permanent.

In reality, the "long-term options" considered in our study are likely to only remain feasible for several decades, possibly only 30 years or less, due to the dynamic and receding nature of the coastline. Comparing the outcomes of the survey with the response of community representatives who participated in the MCA, the more informed MCA participants have assessed these "long term options" as less favourable than a flexible and adaptive approach to future management of the beach erosion and recession problems. Furthermore, the engineered protection options considered in the past are expected to be too expensive for consideration within the CMP.

The values identified by the community were used in the shaping of criteria used in the MCA. The consultation report (provided as Appendix C) contains further detail which will prove useful beyond development of the CMP and should help with future work in the community as it contends with the ongoing impacts of sea-level rise. We recommend that Council "close the loop" on these engagement activities by explaining to the community how the findings have informed the development of the CMP.

6.2 Summary of Analyses

The key outcomes of the analyses completed during this study are summarised in Table 21. In that table, the suite of options has been grouped for Old Bar and for the coast between Farquhar Inlet and Manning Point. Within these groups, the scores of the options have been normalised so that the 'best performing' option has a value of 100. For example, the flexible adaptation option, which was the best performing option for Old Bar has a normalised MCA score of 100. In comparison, the second highest ranking option which has a normalised value of 44 indicates that, while it scores positively overall, it is less than "half as good" as the flexible adaptation option. In comparison, the multipurpose reef / submerged breakwater and rock filled bag revetments score negatively, indicating that these are not worth pursuing as they are expected to have an overall negative impact and are therefore not worth spending any money upon.

Similarly to Old Bar, the ranking of options for the stretch between Farquhar Inlet and Manning Point shows a strong preference for the softer options at Mitchell's Island and Manning Point, with large dredging and training options at Farquhar Inlet having limited support. At Manning Point, this could be combined with a strategic local adaptation planning approach.

Table 21 Key Study Findings

Option	MCA Normalised Score (all participants, all criteria)	MCA Rank per site (all participants, all criteria)	Cost ($Million AUD)	Comment
Old Bar Lewis St Rock Revetment	9	6	12.5	Robust, engineered solution but still likely to eventually lose beach. May only work for ~30 years. Still probably requires sand import to repair end effects. Expect 2 to 3% of capital cost for maintenance p.a.
Old Bar Pacific Parade Rock Revetment	13	5	10.6	Robust, engineered solution but still likely to eventually lose beach. May only work for ~30 years. Still probably requires sand import to repair end effects. Expect 2 to 3% of capital cost for maintenance p.a.

Option	MCA Normalised Score (all participants, all criteria)	MCA Rank per site (all participants, all criteria)	Cost ($Million AUD)	Comment
Old Bar Submerged Breakwater / Multipurpose Reef	-20	8	26.0	Earlier cost estimates were likely low, expect 3 to 5% of capital cost for maintenance p.a.
Old Bar GSC Container Wall	18	4	8.63	Lower Cost than full revetment, (includes both Lewis and Pacific Parade), but may only last for 10-15 years. Lewis St could be protected first at reduced cost.
Old Bar Rock Filled Bag Revetment	-8	7	17.2	More moderate cost than full rock revetment, but limited experience with these units in surf zone in Australia and care would be needed.
Old Bar – Property Purchase	44	2	90.0	Difficult to ascertain, but this is the full estimated purchase price of beachfront residential property in Old Bar at present.
Old Bar – Beach Scraping	33	3	0.15/year	Is a short term, stop gap measure for beach repair, won't solve long term chronic issues.
Old Bar Flexible Adaptation (including managed retreat)	100	1	0.1/year for 5 years	Internal council staff effort, likely worth around the same amount is needed in addition (0.8-1.0 FTE). Best practice strategic approach but doesn't include any implementation. This may also be considered for Manning Point, but Old Bar is a priority.
Farquhar Inlet – Dredging to keep entrance open.	9	3	2.25, then 1.6/yr	Estimated $32-33M AUD over 20 years.
Farquhar Inlet – dredging and training structures	-51	4	>40	Based on original analysis from 2010, costs were much lower, but likely to result in ineffective structure. Very expensive.
Farquhar Inlet – Dredge to form Lake behind Berm	-137	5	8.8	Reasons/Justification for option seem very unclear.
Mitchell's Island – Soft options	70	2	45 (nourishment) 0.21/yr (scraping)	Effective nourishment requires extensive placement of sand, mechanism for this to happen and immature market in NSW makes it extraordinarily expensive. Scraping may be considered initially, but is only a short-term solution, sometimes very short.
Manning Point – Soft options	100	1	80 (Nourishment) 0.36/yr (scraping) 0.22/yr (dune rehabilitation)	Nourishment includes that for Mitchell Island as well (row above), subject to same limitations. Options could be combined as a suite as part of local adaptation planning for Manning Point.

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Appendix A Identification of Criteria

A.1 List of Adopted Criteria

Table A.1 Adopted Criteria

ID	Title	Description
A1	**Acceptability - Ecosystems**	How well would the option protect natural processes and ecosystems?
A2	**Acceptability - Public Access**	How would the option affect public access to the coast?
A3	**Acceptability – Community Benefits**	How well would the option support community participation, provide education, and help to improve community cohesion and resilience?
A4	**Acceptability – Risk Abatement**	How well would the option protect coastal assets and reduce the risks associated with coastal hazards?
A5	**Acceptability - Longevity**	How effective would the option be over a long time frame?
A6	**Acceptability - Recreation**	• How well would the option contribute to public recreation activities, such as: -Walking or running -Dog Walking -Bird Watching -Swimming -Fishing?
A7	**Acceptability - Suitability**	How suitable is the option for this location, considering the size, likely design aspects, provision of open space, use of the surf zone, and the overall mix of urbanised and natural coastline?
A8	**Acceptability - Governance**	How well does the option encourage stronger governance of the coast, including cooperation of public authorities, sustainable land use planning, minimising overlaps between government agencies, and the promotion of monitoring, research, and education?
FA1	**Fairness - Cultural and Social Values**	How well does the option promote social and cultural values and continued use of the coastal zone for social and cultural purposes.
FA2	**Fairness - Equity**	How well does the option represent an equitable outcome, are the costs fairly distributed among key beneficiaries and/or is there a wider public benefit?
FA3	**Fairness – Sustainability and Resilience**	How well does the option promote or improve continued, sustainable use of the coastal environment, including public access, amenity, and the use of beaches?
FA4	**Fairness – Aboriginal Peoples**	How well does the option acknowledge Aboriginal peoples' spiritual, social, customary, and economic use of the coastal zone?
FA5	**Fairness – Risks, Hazards, and Safety**	How well does the option protect the community from exposure to coastal hazards and associated safety risks, both now and in the future?

ID	Title	Description
FE1	**Feasibility - Achievability**	How confident are we that the option be will achieved in a timely manner, considering the resources that are available. Can it be planned, designed, implemented, and monitored given available expertise?
FE2	**Feasibility – Environmental Effectiveness**	How well would the option protect and/or rehabilitate aspects of the coastal environment including coastal wetlands and littoral rainforests, biological diversity and ecosystem integrity, coastal waters (including lagoons, lakes, and estuaries), water quality, estuary health, beaches, dunes, and foreshores? Consider how effective this option might be in the context of climate change.
FE3	**Feasibility – Hazard Mitigation Effectiveness**	How well would the option mitigate against risks arising from coastal hazards? Does the action aim to reduce current and future exposure or to increase the resilience of existing land uses to coastal hazards and climate change?
FE4	**Feasibility - Adaptability**	How adaptable is the option? For example, does it recognise the changing and uncertain nature of the coastal environment and plan accordingly? Does it allow for transition to alternative management approaches if circumstances change or is it “irreversible” (i.e. locks the community of the future into a predetermined course of action)?
FE5	**Feasibility – Prior Experience**	How confident are we in the expected performance? Is there evidence of effectiveness from previous applications of technologies in addressing the same types of issues? Is there a clear potential for unintended negative consequences (or a high likelihood of unanticipated negative consequences)?

A.2 Cross Referencing of Source Criteria with Adopted Criteria

Table CMA: Cross Reference between MCA Criteria and Objects/Objectives of the Coastal Management Act 2016

		Short Name	ID	Source	Broad Category	Referenced by Criterion	Description from Act
CM Objects	1	Coastal Processes/Values	CMA01	CM Act Object	Feasibility	FE2	to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience
	2	Social and Cultural Values	CMA02	CM Act Object	Fairness	FA1	to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety
	3	Aboriginal Values/Uses	CMA03	CM Act Object	Fairness	FA4	to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone
	4	Coastal Economies	CMA04	CM Act Object	Fairness	FA2	to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies
	5	Ecologically Sustainable Development	CMA05	CM Act Object	Acceptability	A8	to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making
	6	Coastal Hazards / Climate Change	CMA06	CM Act Object	Fairness	FA5	to mitigate current and future risks from coastal hazards, taking into account the effects of climate change
	7	Ambulatory Recognition	CMA07	CM Act Object	Feasibility	FE4	to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea
	8	Integrated Planning/Management	CMA08	CM Act Object	Acceptability	A8	to promote integrated and co-ordinated coastal planning, management and reporting
	9	Resilience of Coastal Assets	CMA09	CM Act Object	Feasibility	FE4	to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events
	10	Co-ordinated Management Activities	CMA10	CM Act Object	Feasibility	A8	to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities
	11	Public Participation/Understanding	CMA11	CM Act Object	Acceptability	A3	to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions
	12	Identify Land for Protection	CMA12	CM Act Object	Fairness	FA3	to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order <<for the environment>>
Coastal Wetland Objectives	1	Natural Biodiversity/Integrity	CMA13	CWLR Objective	Feasibility	FE2	to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity
	2	Rehabilitation/Restoration	CMA14	CWLR Objective	Feasibility	FE2	to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests
	3	Resilience/Migration	CMA15	CWLR Objective	Feasibility	FE2	to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration
	4	Social/Cultural Values	CMA16	CWLR Objective	Fairness	FA1	to support the social and cultural values of coastal wetlands and littoral rainforests
	5	Promote State Policies/Programs	CMA17	CWLR Objective	Acceptability	A1	to promote the objectives of State policies and programs for wetlands or littoral rainforest management
Coastal Environment Objectives	1	Environmental Values/Processes	CMA18	CEA Objective	Feasibility	FE2	to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character
	2	Resilience of Coastal Waters	CMA19	CEA Objective	Feasibility	FE2	to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change
	3	Water Quality	CMA20	CEA Objective	Feasibility	FE2	to maintain and improve water quality and estuary health
	4	Social/Cultural Values	CMA21	CEA Objective	Fairness	FA1	to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons
	5	Beaches / Dunes / Natural Features	CMA22	CEA Objective	Fairness	FA3	to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place
	6	Public Access/Amenity	CMA23	CEA Objective	Fairness	FA3	to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms
Coastal Use Objectives	1	Natural Scenic Quality	CMA24	CUA Objective	Acceptability	A7	the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast
	2	Cultural / Built Environment Heritage	CMA25	CUA Objective	Fairness	FA1	adverse impacts of development on cultural and built environment heritage are avoided or mitigated
	3	Urban Design	CMA26	CUA Objective	Acceptability	A7	urban design, including water sensitive urban design, is supported and incorporated into development activities
	4	Public Open Space	CMA27	CUA Objective	Acceptability	A7	adequate public open space is provided, including for recreational activities and associated infrastructure
	5	Use of Surf Zone	CMA28	CUA Objective	Acceptability	A7	the use of the surf zone is considered
	6	Urbanised and Natural Coastline	CMA29	CUA Objective	Acceptability	A7	to accommodate both urbanised and natural stretches of coastline
Coastal Vulnerability Objectives	1	Public Safety	CMA30	CVA Objective	Fairness	FA5	to ensure public safety and prevent risks to human life
	2	Mitigate Coastal Hazards	CMA31	CVA Objective	Feasibility	FE3	to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change
	3	Maintain Beaches	CMA01	CVA Objective	Feasibility	FE2	to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place
	4	Public Amenity	CMA02	CVA Objective	Fairness	FA1	to maintain public access, amenity and use of beaches and foreshores
	5	Sensible Land Use	CMA03	CVA Objective	Feasibility	FA4	to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions
	6	Reduce Hazard Exposure	CMA04	CVA Objective	Fairness	FA2	to adopt coastal management strategies that reduce exposure to coastal hazards
	7	Do no harm	CMA05	CVA Objective	Fairness	A8	if taking that other action to reduce exposure to coastal hazards <<avoid degradation and allow for restoration>>
	8	Essential Infrastructure	CMA06	CVA Objective	Feasibility	FA5	if taking that other action to reduce exposure to coastal hazards
	9	Resilient Development	CMA07	CVA Objective	Feasibility	FE4	to improve the resilience of coastal development and communities by improving adaptive capacity and reducing reliance on emergency responses.
MEMA Objects	1	Biologically diverse and healthy	CMA08	MEMA Object	Feasibility	A8	promotes a biologically diverse, healthy and productive marine estate
	2	Economic Opportunities	CMA09	MEMA Object	Fairness	FE4	economic opportunities for the people of New South Wales, including opportunities for regional communities
	3	Cultural, Social, Recreational	CMA10	MEMA Object	Acceptability	A8	the cultural, social and recreational use of the marine estate
	4	Ecosystem Integrity	CMA11	MEMA Object	Feasibility	A3	the maintenance of ecosystem integrity
	5	Scientific Research and Education	CMA12	MEMA Object	Acceptability	FA3	the use of the marine estate for scientific research and education
	6	Promote Coordination	CMA13	MEMA Object	Acceptability	FE2	to promote the co-ordination of the exercise, by public authorities, of functions in relation to the marine estate
	7	Management of Marine Parks	CMA14	MEMA Object	Acceptability	FE2	to provide for the declaration and management of a comprehensive system of marine parks and aquatic reserves

Table CMM: Cross Reference between MCA Criteria and Text Descriptors from the Coastal Management Manual 2018

ID	Source	Broad Category	Referenced by Criterion	Text Descriptor
CMM01	Part C, p43	Feasibility	Redundant	are consistent with the objects of the CM Act and management objectives of the coastal management areas
CMM02	Part C, p43	Feasibility	Redundant	comply with statutory and policy requirements at local, state and Commonwealth levels
CMM03	Part C, p43	Feasibility	FE2	are environmentally acceptable and consistent with Ecologically Sustainable Development Principles
CMM04	Part C, p43	Feasibility	FE1	are feasible in engineering terms, i.e. a structure can realistically be built, given the local process context
CMM05	Part C, p43	Feasibility	FE5	can address the identified issues, mitigating risks or enhancing opportunities, based on previous experience
CMM06	Part C, p43	Feasibility	FE4	are adaptive and can transition to alternative approaches when circumstances change
CMM07	Part C, p43	Feasibility	FE1	are broadly able to be implemented, in terms of available capacity and capability
CMM08	Part C, p43	Feasibility	FE1	are likely to contribute new knowledge about effective management; for instance, a response that is structured as a carefully controlled trial of new technology.
CMM09	Part C, p43	Feasibility	FE4	to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events
CMM10	Part C, p43	Feasibility	FE2	the timeframe over which the effectiveness of an action can be maintained
CMM11	Part C, p43	Feasibility	FE5	evidence from application of the action in similar situations
CMM12	Part C, p43	Feasibility	FE5	the limits to effectiveness (e.g. a threshold event in which a response will fail)
CMM13	Part C, p43	Feasibility	FE5	the potential for any unintended or unanticipated negative consequences (sometimes referred to as perverse outcomes)
CMM14	Part C, p43	Feasibility	FE4	the irreversibility of some actions that predetermines the future action or pathway
CMM15	Part C, p43	Feasibility	FE1	the level of expertise required to evaluate the design, implementation, monitoring and review of actions
CMM16	Part C, p43	Feasibility	FE4	whether the selection of a strategy allows for adaptive management.
CMM17	Part C, p46	Acceptability	Redundant	consistency with the objectives of the CM Act and council's long-term strategic direction
CMM18	Part C, p46	Acceptability	FA2	public interest and wider public benefit
CMM19	Part C, p46	Acceptability	A4	effectiveness in reducing risks and threats
CMM20	Part C, p46	Acceptability	A7	whether the action is proportional to the level of risk
CMM21	Part C, p46	Acceptability	FA3	sustainability
CMM22	Part C, p46	Acceptability	FA2	potential impacts and their distribution
CMM23	Part C, p46	Acceptability	N/A (Viability)	value for money and efficient use of resources
CMM24	Part C, p46	Acceptability	FE1	timeliness
CMM25	Part C, p46	Acceptability	FA2	fairness and equity
CMM26	Part C, p46	Acceptability	A3	community cohesion and resilience.

Table COM: Cross Reference between MCA Criteria and Community Consultation Outcomes

ID	Source	Broad Category	Referenced by Criterion	Text Descriptor
COM01	Micromex, p6	Acceptability	A1	Does the proposed action aim to protect natural processes and ecosystems (Community Importance 4.66)
COM02	Micromex, p6	Acceptability	A2	Does the proposed action maintain public access and use (Community Imporatnce 4.56)
COM03	Micromex, p6	Acceptability	A3	Does the proposed action support community participation and education around coastal management (Community Importance 4.36)
COM04	Micromex, p6	Acceptability	A4	Does the proposed action protect coastal assets and property, including from sea level rise (Community Importance 4.26)
COM05	Micromex, p6	Acceptability	A5	Does the problem resolve a problem over a longer time frame
COM06	Micromex, p8	Acceptability	A6	Would the proposed action affect Walking or Running along the Beach
COM07	Micromex, p8	Acceptability	A6	Would the proposed action affect Dog Walking along the Beach
COM08	Micromex, p8	Acceptability	A6	Would the proposed action affect Bird Watching Activities
COM09	Micromex, p8	Acceptability	A6	Would the proposed action Affect Swimming Activities
COM10	Micromex, p8	Acceptability	A6	Would the proposed action Affect Fishing around the coast
COM11	Micromex, p19	Acceptability	A5	Does the option represent an attempt to fight a "losing battle" against nature?

Appendix B Outcomes of Multi Criteria Assessment

Importance Scores (0 to 10)

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community/Unnamed	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	10	8	9	9	10	10	10	9	4	8	7	10	9	9		8	10	10	9	7	8	10	10	6		8.70	8.38	9.40	9.25	9.00
Acceptability - Public Access	7	7	9	8	8	7	8	10	10	6	10	2	7	8		5	8	10	10	8	8	10	8	2		7.65	7.56	8.00	7.88	7.67
Acceptability – Community Benefits	5	4	7	7	9	8	8	8	6	8	10	7	10	8		9	9	10	9	10	7	10	10	6	10	8.13	8.35	8.80	7.50	5.33
Acceptability – Risk Abatement	10	10	8	7	7	6	7	8	10	8	9	5	8	9		10	9	10	10	8	8	10	10	6		8.39	8.19	8.40	8.75	9.33
Acceptability - Longevity	6	2	6	8	7	5	5	8	6	10	10	9	9	9		8	8	10	10	10	5	10	5	8	10	7.67	7.94	8.00	6.75	4.67
Acceptability - Recreation	7	6	8	8	10	7	8	10	10	10	10	2	8	8		5	8	10	10	10	8	10	10	3	10	8.17	7.94	9.60	8.63	7.00
Acceptability - Suitability	5	2	7	9	8	10	10	9	7	10	10	7	9	9	7	9	10	10	8	10	8	10	8	10	10	8.48	8.94	9.00	7.38	4.67
Acceptability - Governance	5	5	9	8	8	8	10	8	3	9	10	10	10	9	7	8	10	10	10	6	7	10	10	9	10	8.36	8.44	9.00	8.00	6.33
Fairness - Cultural and Social Values	6	10	8	9	8	8	7	8	5	8	8	6	10	9	10	10	8	10	6	10	5	10	8	5	5	7.88	7.50	8.60	8.38	8.00
Fairness - Equity	9	8	6	9	8	8	7	7	4	6	9	7	6	9	8	6	9	10	7	10	5	10	8	6	10	7.68	7.39	8.20	8.00	7.67
Fairness – Sustainability and Resilience	8	7	9	9	9	10	8	8	10	8	10	4	9	8	8	7	10	10	10	10	8		8	10	8	8.58	8.67	8.50	8.29	8.00
Fairness – Aboriginal Peoples	10	8	8	9	9	10	7	8	5	6		10	10	9	5	10	8	5	5	10	5	10	10	1	9	7.79	7.18	8.80	8.75	8.67
Fairness – Risks, Hazards, and Safety	10	8	8	9	8	7	10	10	10	8	10	5	10	9	9	10	9	10	10	10	7	10	8	7	5	8.68	8.61	8.60	8.63	8.67
Feasibility - Achievability	4	9	9	9	9	10	10	10	6	10	10	10	10	10	10	8	9	10	10	7	7	10	8	9	10	8.96	9.06	9.20	8.50	7.33
Feasibility – Environmental Effectiveness	7	8	7	8	10	10	10	9	8	9	10	10	10	9	10	8	10	10	10	10	8	10	10	6	9	9.04	9.17	9.40	8.63	7.33
Feasibility – Hazard Mitigation Effectiveness	6	6	7	10	9	7	10	8	8	8	8	7	9	10	9	10	8	10	9	10	7	10	7	10	4	8.28	8.39	8.80	7.88	6.33
Feasibility - Adaptability	6	8	7	10	10	10	10	7	7	10	8	9	10	10	9	7	9	10	10	10	7	10	10	10	10	8.96	8.89	10.00	8.88	7.00
Feasibility – Prior Experience	4	7	8	8	7	3	8	6	5	3		10	7	8	10	5	8	10	7	10	7	10	7	10	6	7.25	7.47	7.00	6.75	6.33

Management Option: Old Bar Option 2: Rock Revetment Wall (Lewis St)

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community/Unnamed	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	-4	-2	0	-2	-2	2	2	-4	-2	3	1	-1	2	-4	2	4	2	-2	-2	2	2	-3	-4	2	1	-0.28	0.41	-1.60	-1.75	-2.00
Acceptability - Public Access	-4	-3	0	-2	-3	2	1	-2	0	3	1	-3	2	-2	-2	2	2	-2	-2	0	0	3	-2	-2	-3	-0.64	-0.47	-0.20	-1.00	-2.33
Acceptability – Community Benefits	0	-4	0	0	1	0	1	-4	0	4	-2	0	2	0	-2	4	2	0	-4	2	-2	3	-2	2	1	0.08	0.00	1.20	0.25	-1.33
Acceptability – Risk Abatement	3	2	3	3	2	4	1	1	4	1	2	3	2	2	-2	2	2	2	-4	3	2	3	2	2	2	1.88	1.65	2.20	2.38	2.67
Acceptability - Longevity	3	3	2	3	1	4	1	2	4	3	1	2	2	1	-2	2	2	-4	-4	3	2	4	2	0	-1	1.44	0.88	2.60	2.63	2.67
Acceptability - Recreation	-4	-3	-2	-2	-1	2	1	-4	-2	0	-1	-2	2	2	-2	0	0	-2	-4	0	0	4	-2	2	-1	-0.76	-0.53	-0.20	-1.25	-3.00
Acceptability - Suitability	-4	-3	1	1	2	2	-1	-4	2	2	1	-3	2	2	0	2	2	-2	-4	2	4	3	-2	0	-1	0.16	0.24	1.20	0.00	-2.00
Acceptability - Governance	0	-4	-1	0	1	0	1	-4	2	3	0	0	0	2	0	2	2	-2	-4	1	-2	3	-2	0	1	-0.04	-0.06	1.00	0.00	-1.67
Fairness - Cultural and Social Values	-4	-3	-3	0	2	0	2	-4	-2	0	1	-1	0	2	2	2	2	0	-4	-2	0	4	-2	0	1	-0.28	-0.06	0.80	-0.75	-3.33
Fairness - Equity	-4	2	0	2	1	0	2	-4	-4	2	-1	-2	2	-2	-2	2	2	-2	-4	2	0	4	-4	2	-3	-0.36	-0.71	1.00	0.38	-0.67
Fairness – Sustainability and Resilience	-4	-3	-3	-2	0	2	2	-4	2	2	1	-1	2	-2	-2	2	2	2	-4	-3	0	4	-2	0	1	-0.32	0.00	0.40	-1.00	-3.33
Fairness – Aboriginal Peoples	-4	-4	-1	0	0	0	0	-4	0	0	0	-2	2	0	0	2	0	0	-4	0	0	4	-4	0	-1	-0.64	-0.41	0.00	-1.13	-3.00
Fairness – Risks, Hazards, and Safety	1	-1	2	3	2			-2	-4	2	1	2	2	1	4	2	2	-4	-4	2	2	3	0	2	1	0.83	0.47	2.00	1.50	0.67
Feasibility - Achievability	2	3	4	2	1			-4	-2	2	3	1	2	0	2	2	2	-4	-4	4	4	3	2	2	-3	1.04	0.33	2.00	2.38	3.00
Feasibility – Environmental Effectiveness	0	-4	0	-2	-2			-4	0	1	0	0	2	-2	-2	4	2	-4	-4	0	3	3	0	2	-2	-0.39	-0.33	0.00	-0.50	-1.33
Feasibility – Hazard Mitigation Effectiveness	2	2	3	2	3			-2	2	2	2	2	0	-1	4	2	2	-2	-4	3	3	3	2	2	1	1.43	0.93	2.40	2.38	2.33
Feasibility - Adaptability	0	-2	-3	2	-1			-4	-4	1	1	-2	0	-2	4	2	2	-4	-4	1	3	3	-2	0	1	-0.35	-0.40	0.60	-0.25	-1.67
Feasibility – Prior Experience	0	3	4	3	3			-4	-4	0	2	3	2	2	4	2	2	-4	-4	2	2	3	-4	0	1	0.78	0.40	1.00	1.50	2.33

Management Option: Option 3: Rock Revetment Wall (Pacific Pde)

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	-4	-1	0	-2	-3	4	2	-4	-2	3	1	-1	2	-4	2	2	2	-2	-2	3	2	-3	-4	2	3	-0.16	0.59	-1.80	-1.75	-1.67
Acceptability - Public Access	-4	0	-2	-2	-2	2	0	-4	2	3	1	-3	2	-2	-2	2	2	-2	-2	0	0	3	-2	-1	-3	-0.56	-0.47	0.00	-0.75	-2.00
Acceptability – Community Benefits	0	-4	0	0	1	2	0	-2	-2	4	-2	2	2	0	2	2	2	0	-4	2	-2	3	-2	2	3	0.36	0.41	1.20	0.25	-1.33
Acceptability – Risk Abatement	3	2	3	3	2	4	1	1	4	1	2	3	2	2	0	2	2	2	-4	1	2	4	2	2	3	1.96	1.71	2.40	2.50	2.67
Acceptability - Longevity	3	3	2	3	2	4	1	2	-2	3	1	2	2	1	2	2	2	-4	-4	2	2	4	2	0	2	1.48	0.88	2.80	2.75	2.67
Acceptability - Recreation	-4	-1	-2	-2	-1	4	1	-2	-2	0	1	-2	2	2	-2	0	0	-2	-4	-1	0	4	-2	2	-1	-0.48	-0.24	-0.20	-1.00	-2.33
Acceptability - Suitability	-4	-2	1	1	2	2	-1	-4	2	2	3	-2	2	2	0	2	2	-2	-4	-2	4	3	-2	0	2	0.28	0.35	1.20	0.13	-1.67
Acceptability - Governance	0	-3	0	0	1	2	1	-4	-2	3	0	0	0	2	0	2	2	-2	-4	2	-2	3	-2	0	1	0.00	-0.12	1.00	0.25	-1.00
Fairness - Cultural and Social Values	-4	-2	-3	0	2	0	2	-4	-2	0	2	-1	0	2	0	2	2	0	-4	1	0	4	-2	0	1	-0.16	0.06	0.80	-0.63	-3.00
Fairness - Equity	-4	1	-1	2	1	2	2	-4	-4	2	-1	0	2	2	0	2	2	-2	-4	-1	0	4	-4	2	-3	-0.16	-0.29	1.00	0.13	-1.33
Fairness – Sustainability and Resilience	-4	-2	-3	-2	0	2	2	-4	0	2	3	-1	2	-2	-2	2	2	2	-4	3	0	4	-2	0	2	0.00	0.41	0.40	-0.88	-3.00
Fairness – Aboriginal Peoples	-4	-4	-1	0	0	0	0	-4	0	0	0	-2	2	0	0	2	0	0	-4	0	0	4	-4	0	-1	-0.64	-0.41	0.00	-1.13	-3.00
Fairness – Risks, Hazards, and Safety	1	-1	2	3	2			-1	-4	2	1	2	2	1	4	2	2	-4	-4	3	2	3	0	2	3	1.00	0.73	2.00	1.50	0.67
Feasibility - Achievability	2	3	4	2	1			-4	-2	2	3	1	2	1	2	2	2	-4	-4	1	4	3	2	2	-2	1.00	0.27	2.00	2.38	3.00
Feasibility – Environmental Effectiveness	0	-3	0	-2	-2			-4	0	1	0	0	2	-2	-2	2	2	-4	-4	-1	3	3	0	2	-1	-0.43	-0.47	0.00	-0.38	-1.00
Feasibility – Hazard Mitigation Effectiveness	2	2	3	2	3			-2	2	2	3	2	0	-1	4	2	2	-2	-4	0	3	3	2	2	1	1.35	0.80	2.40	2.38	2.33
Feasibility - Adaptability	0	-2	-3	2	-1			-4	-4	1	1	-2	0	-2	4	2	2	-4	-4	-3	3	3	-2	0	1	-0.52	-0.67	0.60	-0.25	-1.67
Feasibility – Prior Experience	0	3	4	3	3			-4	-4	0	3	3	2	2	4	2	2	-4	-4	3	2	-3	-4	0	2	0.65	0.60	-0.20	0.75	2.33

Management Option: Option 4: Submerged Breakwater/ Reef

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	2	-2	1	1	2	4	0	-2	4	0	-2	1	0	-2	3	2	-2	-2	-2	4	3	-3	-2	2	0	0.40	0.65	-0.40	-0.13	0.33
Acceptability - Public Access	0	0	0	0	2	2	0	-1	0	2	2	0	2	0	3	4	0	0	-2	3	0	-3	0	4	2	0.80	1.12	0.20	0.13	0.00
Acceptability – Community Benefits	2	-2	0	0	1	2	0	-4	0	1	-1	-2	2	0	2	4	-4	0	-4	2	1	-3	0	4	2	0.12	0.24	-0.20	-0.13	0.00
Acceptability – Risk Abatement	0	0	-1	0	1	2	-2	-2	0	0	-3	-2	-2	-1	-1	2	-4	2	-4	1	2	-3	0	2	1	-0.48	-0.53	-0.40	-0.38	-0.33
Acceptability - Longevity	0	-3	0	-1	1	2	-2	0	-2	1	1	-3	-2	0	0	0	-4	-4	-4	-3	3	-3	0	4	1	-0.72	-0.76	-0.40	-0.63	-1.00
Acceptability - Recreation	2	1	0	1	2	0	0	-1	2	-1	2	-3	0	2	4	0	0	2	-4	0	1	-3	0	4	2	0.52	0.65	-0.20	0.25	1.00
Acceptability - Suitability	0	0	-2	0	1	2	0	-4	0	-2	1	-4	0	-1	4	0	0	4	-4	2	4	-3	0	0	-1	-0.12	0.18	-0.80	-0.75	-0.67
Acceptability - Governance	0	-3	0	-1	-1	0	-1	-4	0	2	0	-1	-2	2	2	2	-4	-2	-4	1	0	-3	0	0	1	-0.64	-0.59	-0.60	-0.75	-1.00
Fairness - Cultural and Social Values	2	0	0	0	0	2	0	-2	-4	0	1	-4	0	2	2	2	-4	0	-4	3	1	-3	0	0	1	-0.20	-0.24	-0.60	-0.13	0.67
Fairness - Equity	2	-4	-4	0	1	2	0	-4	4	1	-1	-1	0	0	2	2	-4	-2	-4	-4	1	-3	-2	2	1	-0.60	-0.35	-0.60	-1.13	-2.00
Fairness – Sustainability and Resilience	0	0	0	2	1	2	0	-4	4	1	1	-4	0	-1	4	2	-2	4	-4	-2	1	-3	0	0	2	0.16	0.18	0.20	0.13	0.00
Fairness – Aboriginal Peoples	0	0	0	0	1	0	0	-4	0	0	0	-2	0	0	2	2	0	0	-4	0	0	-3	-2	0	-2	-0.48	-0.47	-0.80	-0.50	0.00
Fairness – Risks, Hazards, and Safety	-2	-3	0	0	0			-2	-4	1	-2	-4	-2	0	2	2	-4	-4	-4	0	2	-3	-2	4	1	-1.04	-1.00	-0.80	-1.13	-1.67
Feasibility - Achievability	-4	-2	-2	-2	0			-4	-4	1	-1	-4	0	-2	-2	0	-4	-4	-4	0	4	-3	2	2	-1	-1.48	-1.60	-0.40	-1.25	-2.67
Feasibility – Environmental Effectiveness	2	-4	0	0	2			-2	2	1	-3	-2	0	-4	4	2	-4	-4	-4	0	3	-3	0	2	-2	-0.61	-0.80	0.00	-0.25	-0.67
Feasibility – Hazard Mitigation Effectiveness	0	0	-1	-2	1			-1	-2	1	-1	-4	0	-4	2	2	-4	2	-4	0	3	-3	0	2	-2	-0.65	-0.73	-0.60	-0.50	-0.33
Feasibility - Adaptability	1	-1	0	-1	1			-4	0	1	0	-4	-2	-4	2	0	-4	-2	-4	0	3	-3	-2	0	1	-0.96	-1.20	-0.80	-0.50	0.00
Feasibility – Prior Experience	-4	-2	-2	-3	1			-4	-4	0	-1	-1	0	-4	-2	0	-4	-4	-4	0	3	-3	-4	0	1	-1.78	-1.60	-1.80	-2.13	-2.67

Management Option: Option 5: Sand Filled Container Revetment

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	-4	0	0	-1	0	2	0	-1	2	1	2	1	2	-4	2	2	2	-2	-2	2	2	4	2	2	-1	0.52	0.65	1.20	0.25	-1.33
Acceptability - Public Access	-4	-2	-1	0	0	2	-2	-3	-2	1	1	1	2	-2	2	2	2	2	-2	-1	0	4	0	-2	2	0.00	0.12	1.00	-0.25	-2.33
Acceptability – Community Benefits		-2	0	1	1	2	-2	-2	2	1	-2	1	2	0	2	2	2	0	-4	-3	1	4	0	0	2	0.33	0.18	1.40	0.71	-1.00
Acceptability – Risk Abatement	2	1	2	2	2	2	-2	1	2	1	1	1	2	2	-2	2	2	-2	-4	-4	2	4	2	2	1	0.88	0.35	2.20	2.00	1.67
Acceptability - Longevity	0	1	1	2	1	0	-2	1	2	1	1	1	2	1	-2	2	2	-4	-4	-3	1	4	2	0	-1	0.36	-0.18	2.00	1.50	0.67
Acceptability - Recreation	-4	-1	-2	-1	-1	0	-2	-2	2	0	1	2	2	2	2	0	2	-4	-4	0	0	4	0	0	1	-0.12	0.12	0.40	-0.63	-2.33
Acceptability - Suitability	-4	-1	1	1	2	2	-2	-4	4	1	1	2	2	2	2	2	2	-4	-4	4	3	4	2	2	-2	0.72	0.71	2.00	0.75	-1.33
Acceptability - Governance	0	2	0	0	1	0	0	-4	-2	1	0	0	0	2	2	2	2	-2	-4	3	0	4	0	0	1	0.32	0.00	1.20	1.00	0.67
Fairness - Cultural and Social Values	-4	-2	-3	0	2	2	0	-4	-2	0	-2	1	0	2	2	2	2	0	-4	2	0	4	-2	0	1	-0.12	0.12	0.80	-0.63	-3.00
Fairness - Equity	-4	2	-2	2	1	2	0	-4	-4	1	-1	1	2	2	2	2	2	-2	-4	1	0	4	-2	2	1	0.16	0.12	1.20	0.25	-1.33
Fairness – Sustainability and Resilience	-4	-2	1	-1	0	2	0	-4	2	1	0	1	2	-1	2	2	2	2	-4	-1	0	4	2	0	1	0.28	0.35	1.20	0.13	-1.67
Fairness – Aboriginal Peoples	-4	-4	-1	0	0	0	0	-4	0	0	0	0	2	0	0	2	0	0	-4	0	0	4	-2	0	-3	-0.56	-0.41	0.40	-0.88	-3.00
Fairness – Risks, Hazards, and Safety	1	-1	1	2	1			-1	-4	1	1	0	2	1	2	2	2	-4	-4	3	2	4	0	2	1	0.61	0.33	1.60	1.13	0.33
Feasibility - Achievability	2	3	4	2	2			-2	2	1	3	3	2	1	2	4	2	-4	-4	2	4	4	2	2	1	1.65	1.20	2.20	2.50	3.00
Feasibility – Environmental Effectiveness	0	-4	0	-2	-2			-4	-2	1	0	1	2	-2	0	2	2	-4	-4	4	2	4	2	2	-3	-0.22	-0.27	0.60	-0.13	-1.33
Feasibility – Hazard Mitigation Effectiveness	1	2	2	1	2			-2	-2	1	1	1	0	-1	2	2	2	-2	-4	3	2	4	2	2	-3	0.70	0.07	2.00	1.88	1.67
Feasibility - Adaptability	2	-1	1	3	1			-2	-4	1	1	2	0	-2	2	2	2	0	-4	-1	1	4	2	0	1	0.48	-0.13	2.20	1.63	0.67
Feasibility – Prior Experience	0	2	1	1	3			-2	-4	0	2	2	2	1	2	4	2	-4	-4	2	2	4	-2	0	1	0.65	0.40	1.20	1.13	1.00

Management Option: Option 6: Rock Filled Bag Revetment

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	-4	0	0	-2	-2	2	2	-2	-2	1	-2	0	2	-4	2	0	0	2	-2	2	2	1	-2	2	-3	-0.28	0.06	-0.80	-1.00	-1.33
Acceptability - Public Access	-4	-2	-2	-2	-2	2	1	-3	-4	1	-3	0	2	-2	2	2	-2	2	-2	2	0	1	-2	-2	-1	-0.72	-0.35	-0.80	-1.50	-2.67
Acceptability – Community Benefits		-1	0	0	-1	2	1	-2	0	1	-4	1	2	0	2	2	-2	0	-4	3	1	1	-2	0	-2	-0.08	0.00	-0.20	-0.29	-0.50
Acceptability – Risk Abatement	2	2	2	2	-1	2	1	1	2	1	0	1	2	2	2	2	-2	2	-4	1	2	1	2	2	-1	1.04	0.88	1.00	1.38	2.00
Acceptability - Longevity	0	2	1	2	-1	2	-1	1	4	1	0	1	2	1	2	0	0	-4	-4	-1	2	1	2	0	-1	0.48	0.24	1.00	1.00	1.00
Acceptability - Recreation	-4	-2	-2	-2	-2	2	1	-2	2	0	0	0	2	2	2	0	-2	4	-4	0	0	1	-2	0	-1	-0.28	0.35	-1.00	-1.63	-2.67
Acceptability - Suitability	-4	-1	1	1	-1	2	-1	-4	-4	1	-2	1	2	1	2	2	-2	-4	-4	-2	3	1	-2	2	-3	-0.60	-0.65	0.00	-0.50	-1.33
Acceptability - Governance	0	2	0	0	1	0	1	-4	-2	1	0	0	0	2	2	2	-2	-2	-4	-3	0	1	-2	0	1	-0.24	-0.53	0.20	0.38	0.67
Fairness - Cultural and Social Values	-4	-2	-3	0	0	2	0	-4	-2	0	-3	0	0	2	2	2	0	0	-4	2	0	1	-2	0	-1	-0.56	-0.24	-0.20	-1.25	-3.00
Fairness - Equity	-4	2	-2	2	-1	2	0	-4	-4	1	-1	1	2	2	2	2	0	-2	-4	1	0	1	-4	2	1	-0.20	0.00	-0.20	-0.63	-1.33
Fairness – Sustainability and Resilience	-4	-2	0	-2	-1	2	0	-4	0	1	0	0	2	-1	2	2	-2	2	-4	-3	0	1	-2	0	-1	-0.56	-0.29	-0.60	-1.13	-2.00
Fairness – Aboriginal Peoples	-4	-4	-1	0	1	0	0	-4	0	0	0	0	2	0	0	2	0	0	-4	0	0	1	-4	0	-3	-0.72	-0.41	-0.40	-1.38	-3.00
Fairness – Risks, Hazards, and Safety	1	-1	1	2	-1			-1	-4	1	0	0	2	1	2	2	-2	-4	-4	0	2	1	0	2	1	0.04	-0.20	0.60	0.50	0.33
Feasibility - Achievability	2	3	4	2	3			-2	0	1	3	2	2	1	2	0	-2	-4	-4	0	4	1	2	2	-1	0.91	0.20	1.80	2.25	3.00
Feasibility – Environmental Effectiveness	0	-4	0	-2	-3			-4	-2	1	-1	0	2	-2	0	0	-2	-4	-4	0	2	1	0	2	-3	-1.00	-1.07	-0.60	-0.88	-1.33
Feasibility – Hazard Mitigation Effectiveness	1	2	2	1	2			-2	-2	1	1	1	0	-1	2	2	-2	-2	-4	0	3	1	2	2	-3	0.30	-0.33	1.40	1.50	1.67
Feasibility - Adaptability	2	-1	1	3	-1			-2	-4	1	1	1	0	-2	2	2	-2	-2	-4	0	2	1	-2	0	1	-0.13	-0.47	0.40	0.50	0.67
Feasibility – Prior Experience	0	2	1	1	1			-3	-4	0	-2	0	2	1	0	2	-2	-4	-4	0	3	1	-4	0	-2	-0.48	-0.87	-0.20	0.25	1.00

Management Option: Option 7: Property Purchase

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	0	3	0	1	4	0	4	2	0	4	3	1	0	2	0	4	0	4	4	0	0	2	2	0	0	1.60	1.41	2.60	2.00	1.00
Acceptability - Public Access	1	4	2	2	0	0	2	4	0	0	3	1	-2	0	2	0	0	0	4	0	-4	2	0	0	0	0.84	0.59	0.80	1.38	2.33
Acceptability – Community Benefits	0	-2	1	2	0	0	2	2	4	0	1	-2	-4	0	4	2	-4	0	4	0	-2	2	0	0	0	0.40	0.41	0.80	0.38	-0.33
Acceptability – Risk Abatement	0	0	-2	2	2	0	4	2	4	4	3	1	0	-2	-2	4	4	0	4	0	2	2	-4	0	0	1.12	1.41	1.20	0.50	-0.67
Acceptability - Longevity	0	4	4	4	4	0	4	2	4	2	3	0	0	0	2	2	4	-4	4	0	3	2	0	4	0	1.92	1.65	2.40	2.50	2.67
Acceptability - Recreation	0	3	0	0	1	0	2	1	0	0	0	0	-4	0	4	0	2	-2	4	0	2	2	0	0	0	0.60	0.53	0.60	0.75	1.00
Acceptability - Suitability	4	4	2	2	2	0	4	4	4	-2	2	-2	-4	0	2	4	2	2	4	0	4	2	0	0	0	1.60	1.53	0.80	1.75	3.33
Acceptability - Governance	2	3	2	2	1	0	4	2	4	0	3	1	-4	4	4	2	0	-2	4	0	2	2	0	0	3	1.56	1.59	1.00	1.50	2.33
Fairness - Cultural and Social Values	3	3	3	0	0	0	3	4	4	0	3	1	-4	-2	0	2	0	0	4	0	0	2	0	0	0	1.04	0.88	0.40	1.38	3.00
Fairness - Equity	2	2	-4	-2	2	0	3	-2	-4	0	1	2	-4	0	4	2	2	-4	4	0	-4	2	-4	0	0	-0.08	0.00	-0.40	-0.25	0.00
Fairness – Sustainability and Resilience	2	3	3	1	2	-2	3	2	4	-2	0	0	-4	0	4	2	-4	2	4	0	-4	2	0	0	0	0.72	0.41	0.60	1.38	2.67
Fairness – Aboriginal Peoples	1	2	2	0	1	0	4	0	0	0	1	1	-4	0	0	0	0	0	0	0	0	2	-4	0	0	0.24	0.12	-0.20	0.50	1.67
Fairness – Risks, Hazards, and Safety	1	3	4	4	4			2	4	3	3	3	4	0	4	4	2	-4	4	0	3	2	0	0	0	2.17	1.93	2.60	2.63	2.67
Feasibility - Achievability	-3	-1	-4	1	0			-2	-4	1	1	-4	-4	0	0	4	-4	-4	4	0	-4	2	2	0	-4	-1.00	-1.40	1.20	-0.25	-2.67
Feasibility – Environmental Effectiveness	2	2	0	2	4			2	-2	3	0	1	4	-2	2	2	0	4	4	0	-4	2	0	0	0	1.13	0.73	2.20	1.88	1.33
Feasibility – Hazard Mitigation Effectiveness	1	3	4	4	3			2	4	0	1	1	4	-1	0	4	2	4	4	0	2	2	-4	0	0	1.74	1.80	1.00	1.63	2.67
Feasibility - Adaptability	4	3	4	-2	2			2	4	0	0	0	-4	-2	-2	2	0	-4	4	0	-4	2	0	0	4	0.57	0.00	0.40	1.63	3.67
Feasibility – Prior Experience	3	4	1	2	4			2	-4	0	4	-1	-4	0	2	4	4	-4	4	0	2	2	-4	0	0	0.91	0.60	0.80	1.50	2.67

Management Option: Option 8: Beach Scraping

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	0	0	0	2	4	2	0	1	2	2	-4	0	-2	-2	-2	-4	2	0	-2	2	0	4	0	0	1	0.24	-0.35	2.40	1.50	0.00
Acceptability - Public Access	2	2	0	3	3	2	0	3	2	3	-2	3	0	-2	0	0	2	2	-2	2	1	4	2	4		1.42	0.94	3.00	2.38	1.33
Acceptability – Community Benefits	3	3	0	2	2	2	0	2	0	3	-2	1	0	0	2	-2	2	0	-4	2	2	4	0	2	2	1.04	0.53	2.20	2.13	2.00
Acceptability – Risk Abatement	1	1	1	1	1	2	0	1	2	1	2	1	0	0	-2		2	0	-4	2	0	4	0	0	-3	0.54	0.19	1.40	1.25	1.00
Acceptability - Longevity	0	0	1	1	2	2	0	1	-4	-2	-1	0	-2	0	-2	-4	2	-4	-4	2	-2	4	-2	0	-1	-0.52	-1.00	0.60	0.50	0.33
Acceptability - Recreation	4	2	0	4	2	2	0	3	2	0	-1	1	2	0	2	0	2	-2	-4	0	0	4	0	0	-1	0.88	0.35	2.00	2.00	2.00
Acceptability - Suitability	4	2	3	3	4	2	2	2	4	0	1	1	2	1	2	-2	2	-2	-4	2	2	4	0	0	-2	1.32	0.76	2.20	2.50	3.00
Acceptability - Governance	0	3	1	0	2	2	3	4	-2	2	0	0	0	2	2	-2	2	0	-4	2	0	4	2	0	1	0.96	0.59	2.00	1.75	1.33
Fairness - Cultural and Social Values	2	2	1	1	2	2	2	4	4	0	0	1	0	0	2	-2	2	0	-4	2	0	4	0	0	1	1.04	0.82	1.40	1.50	1.67
Fairness - Equity	4	2	2	3	1	2	2	2	-4	1	-1	1	0	2	4	-2	2	-2	-4	2	0	4	-2	0	1	0.80	0.29	1.40	1.88	2.67
Fairness – Sustainability and Resilience	4	3	2	3	2	2	2	2	2	1	1	1	2	0	2	-4	2	0	-4	2	2	4	0	0	3	1.36	0.88	2.00	2.38	3.00
Fairness – Aboriginal Peoples	0	2	0	2	2	2	0	-2	0	0	0	1	0	0	0	-2	4	0	-4	0	0	4	0	0	-3	0.24	-0.24	1.60	1.25	0.67
Fairness – Risks, Hazards, and Safety	0	0	1	1	2			2	-4	1	1	0	2	1	0	0	2	-4	-4	2	1	4	0	2	-4	0.26	-0.20	1.60	1.13	0.33
Feasibility - Achievability	4	4	4	4	2			4	4	1	3	3	4	1	2	-2	2	-4	-4	2	4	4	2	2	2	2.09	1.53	2.60	3.13	4.00
Feasibility – Environmental Effectiveness	0	1	0	3	2			2	-2	1	-1	2	0	-1	2	-2	2	-4	-4	2	2	4	0	2	-4	0.30	-0.27	2.00	1.38	0.33
Feasibility – Hazard Mitigation Effectiveness	0	0	1	1	1			1	-4	2	1	-1	0	-1	0	-2	2	0	-4	2	2	4	0	2	-4	0.13	-0.40	1.60	1.13	0.33
Feasibility - Adaptability	0	3	2	3	1			2	-4	1	1	2	0	1	-2	-2	2	-4	-4	2	2	4	0	0	-3	0.30	-0.47	1.80	1.75	1.67
Feasibility – Prior Experience	0	1	1	3	3			3	-4	0	0	1	2	1	-2	-2	2	-4	-4	2	-1	4	-2	0	2	0.26	-0.27	1.60	1.25	0.67

Management Option: Option 9: Flexible Adaptation

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	1	2	0	2	3	2	2	3	4	3	2	3	2	0	3	4	4	4	4	4	4	1	4	0	4	2.60	2.88	2.60	2.00	1.00
Acceptability - Public Access	0	3	2	3	3	2	2	4	0	2	1	2	-2	0	3	2	4	4	4	4	1	1	2	0	2	1.96	1.94	2.20	2.00	1.67
Acceptability – Community Benefits	4	3	2	3	2	2	2	4	2	4	4	1	-4	0	4	4	2	0	4	4	4	1	2	0	3	2.28	2.12	2.40	2.63	3.00
Acceptability – Risk Abatement	2	2	-1	1	2	2	2	2	4	3	3	1	-2	0	2	4	2	4	4	4	4	1	2	0	3	2.04	2.29	1.80	1.50	1.00
Acceptability - Longevity	4	3	4	3	2	2	2	4	4	0	3	1	4	2	2	4	2	4	4	4	2	1	4	0	4	2.76	2.82	2.00	2.63	3.67
Acceptability - Recreation	3	3	0	2	2	2	2	3	4	0	1	1	-2	2	2	0	2	4	4	0	2	1	2	0	1	1.64	1.65	1.40	1.63	2.00
Acceptability - Suitability	2	3	2	2	4	2	4	4	4	0	3	0	-2	1	2	4	2	4	4	4	4	1	2	0	4	2.40	2.59	1.80	2.00	2.33
Acceptability - Governance	4	3	3	3	2	2	4	4	4	2	3	3	-2	4	4	4	2	0	4	4	2	1	4	0	2	2.64	2.59	2.40	2.75	3.33
Fairness - Cultural and Social Values	4	3	3	1	2	2	4	4	4	0	4	1	-2	2	2	4	2	2	4	4	0	1	2	0	3	2.24	2.35	1.20	2.00	3.33
Fairness - Equity	1	2	0	1	1	2	3	3	4	2	3	1	-2	3	4	4	2	2	4	4	0	1	0	0	0	1.80	2.18	1.00	1.00	1.00
Fairness – Sustainability and Resilience	4	3	3	2	2	2	4	3	4	1	3	2	-4	1	2	4	2	2	4	4	2	1	2	0	0	2.12	2.06	1.60	2.25	3.33
Fairness – Aboriginal Peoples	2	2	2	1	2	2	4	2	0	0	4	1	-2	0	0	4	0	0	4	0	0	1	-2	0	4	1.24	1.35	0.40	1.00	2.00
Fairness – Risks, Hazards, and Safety	1	3	4	2	2			3	0	3	4	0	4	1	0	4	2	4	4	4	3	1	2	0	4	2.39	2.47	2.00	2.25	2.67
Feasibility - Achievability	4	-1	0	-1	2			-2	0	1	0	-4	-2	2	4	4	2	4	4	4	1	1	2	0	1	1.13	1.20	1.00	1.00	1.00
Feasibility – Environmental Effectiveness	2	2	0	2	2			3	0	3	3	0	2	1	4	4	2	4	4	4	2	1	2	0	4	2.22	2.47	2.00	1.75	1.33
Feasibility – Hazard Mitigation Effectiveness	1	3	2	2	1			3	4	1	3	1	4	1	2	4	4	2	4	4	4	1	2	0	4	2.48	2.93	1.40	1.63	2.00
Feasibility - Adaptability	4	3	4	3	3			4	4	1	4	3	0	4	4	4	4	2	4	4	4	1	2	0	4	3.04	3.27	2.00	2.63	3.67
Feasibility – Prior Experience	0	3	2	1	3			2	0	0	1	-1	-4	2	2	4	2	0	4	4	0	1	2	0	4	1.39	1.33	1.40	1.50	1.67

Management Option: Farquhar Option 2: Dredge to Keep Entrance Open

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agncies/Study Team	Study Team
Acceptability - Ecosystems	-1	-3	-4	-1	-2	3	2	-4	-2	-4	-4	2	2	2	2	2	2	-4	2	4		0	2		-2	-0.26	0.47	-1.00	-1.63	-2.67
Acceptability - Public Access	2	-1	-1	1	3	3	0	-4	-2	-2	0	2	0	0	3	2	0	-4	0	4		0	0		-1	0.22	0.20	0.40	0.25	0.00
Acceptability – Community Benefits	2	-2	0	1	0	3	1	-4	-2	-4	-4	2	2	2	2	2	0	0	2	4		0	2		-1	0.35	0.60	-0.20	-0.13	0.00
Acceptability – Risk Abatement	3	-2	1	0	1	3	1	-4	2	-4	-4	2	2	-2	0	0	2	0	2	0		0	2		-2	0.13	0.13	-0.20	0.13	0.67
Acceptability - Longevity	1	-3	0	-2	1	3	2	-4	2	-4	-4			-2	-2	0	2	0	2	0		-2	0		-3	-0.62	-0.31	-1.40	-1.13	-0.67
Acceptability - Recreation	2	-1	-2	1	1	3	1	0	0	-2	0	2	2	2	2	0	2	2	4	4		-2	2		1	1.04	1.67	0.00	-0.13	-0.33
Acceptability - Suitability	2	-3	0	1	2	3	1	-4	-4	-4	-4	2	2	2	2	0	2	0	4	2		-2	2		-2	0.17	0.40	-0.20	-0.25	-0.33
Acceptability - Governance	1	-3	0	0	1	3	0	-4	0	-4	-4	0	2	2	2	0	0	2	3	0		-2	0		-1	-0.09	0.33	-1.00	-0.88	-0.67
Fairness - Cultural and Social Values	3	-2	-1	0	2	0	1	-4	0	-2	-4	2	2	0	0	0	2	2	0	0		-2	2		0	0.04	0.07	0.00	0.00	0.00
Fairness - Equity	1	-3	-1	0	1	3	1	-4	4	-2	-4	0	2	2	2	0	0	0	3	0		-2	2		-3	0.09	0.40	-0.20	-0.50	-1.00
Fairness – Sustainability and Resilience	2	1	-1	0	2	3	1	-4	-2	-2	-4	2	2	1	1	2	2	2	2	0		-2	2		-2	0.35	0.40	0.00	0.25	0.67
Fairness – Aboriginal Peoples	0	-3	-1	0	0	0	1	0	0	-4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	-1	-0.24	0.12	-0.80	-1.00	-1.33
Fairness – Risks, Hazards, and Safety	2	-3	1	1	1	4	2	-4	-2	-2	-2	2	2	1	-1	2	0	0	3	0	0	0	4	2	-2	0.44	0.41	0.80	0.50	0.00
Feasibility - Achievability	-1	-4	-1	3	1	4	1	-4	-4	-4	-4	-4	4	-1	-1	2	2	2	4	0	2	0	2	2	1	0.08	0.35	0.40	-0.50	-2.00
Feasibility – Environmental Effectiveness	2	1	-4	-1	1	4	1	-4	-4	-4	-4	2	2	1	1	2	0	0	3	2	2	0	2	-2	-2	0.04	0.24	-0.40	-0.38	-0.33
Feasibility – Hazard Mitigation Effectiveness	3	-2	1	1	1	4	1	-4	2	-4	-4	-2	2	1	1	0	0	0	4	2	2	-2	4	1	-2	0.40	0.47	0.00	0.25	0.67
Feasibility - Adaptability	3	-2	-4	3	2	4	1	-4	-4	-4	-4	-2	4	1	1	2	0	-2	3	2	0	-2	4	1	-3	0.00	0.00	0.60	0.00	-1.00
Feasibility – Prior Experience	2	-3	4	1	2	4	3	-4	-4	-4	-2	0	0	1	1	0	0	-2	3	0	-2	-2	2	1	-2	-0.04	-0.18	-0.20	0.25	1.00

Management Option: Farquhar Option 3: Dredging and Training Structure

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	-1	-3	-4	-2	-2	4	-4	-4	-2	-4	-4	2	-2	-1	0	-4	-2	-4	2	4		0	2		-3	-1.39	-1.20	-1.20	-1.75	-2.67
Acceptability - Public Access	2	-1	-1	1	3	4	-3	-4	-2	-2	0	2	0	-1	0	0	0	-4	0	4		0	-4		-2	-0.35	-0.40	-0.40	-0.25	0.00
Acceptability – Community Benefits	2	-2	0	-1	0	4	-1	-4	-2	-4	-4	2	-2	0	0	-4	0	0	2	4		0	2		-2	-0.43	-0.47	-0.60	-0.38	0.00
Acceptability – Risk Abatement	3	-3	1	-2	1	4	-2	-4	2	-4	-4	2	-2	0	0	-2	0	-2	2	0		0	0		-3	-0.57	-0.60	-1.00	-0.50	0.33
Acceptability - Longevity	2	1	0	-2	2	4	-3	-4	2	-4	-4	2	0	1	-4	-4	0	-2	2	0		-2	2		-2	-0.57	-0.80	-0.80	-0.13	1.00
Acceptability - Recreation	1	-2	-2	1	1	4	-3	-2	-2	-2	0	2	-2	2	0	0	2	2	4	4		0	4		-1	0.48	0.67	0.80	0.13	-1.00
Acceptability - Suitability	0	-2	0	-2	1	4	-4	-4	-4	-4	-4	2	-2	2	-1	-4	0	0	4	2		0	2		-3	-0.74	-0.80	-0.60	-0.63	-0.67
Acceptability - Governance	1	-3	0	-2	1	4	0	-4	0	-4	-4	2	-2	2	-1	-2	0	2	3	0		0	0		-2	-0.39	-0.13	-1.00	-0.88	-0.67
Fairness - Cultural and Social Values	3	-2	-1	-2	2	0	-3	-4	0	-2	-4	4	-2	0	0	-2	0	2	0	0		0	2		-2	-0.48	-0.73	0.00	0.00	0.00
Fairness - Equity	1	-3	-2	-2	1	4	-4	-4	2	-4	-4	0	-2	2	0	-4	0	0	3	0		0	-2		-3	-0.91	-0.67	-1.40	-1.38	-1.33
Fairness – Sustainability and Resilience	2	1	-1	0	2	4	-2	-4	-2	-4	-4	4	-2	1	0	-4	0	2	2	0		0	-4		-3	-0.52	-0.53	-1.20	-0.50	0.67
Fairness – Aboriginal Peoples	0	-4	-1	0	0	0	-2	0	0	-4	0	0	-2	0	0	-4	0	0	0	0	0	0	0	0	-4	-0.84	-0.71	-0.80	-1.13	-1.67
Fairness – Risks, Hazards, and Safety	2	-3	1	1	1	4	-2	-4	2	-2	-2	2	-2	1	-4	-4	0	0	3	0	0	0	4	2	-3	-0.12	-0.41	0.80	0.50	0.00
Feasibility - Achievability	-4	-4	-1	-3	0	4	-2	-4	-4	-4	-4	-4	-2	-1	-4	0	-2	2	4	0	2	0	-4	0	-1	-1.44	-0.94	-2.20	-2.50	-3.00
Feasibility – Environmental Effectiveness	2	1	-4	-2	1	4	-2	-4	-4	-4	-4	2	-2	1	0	-4	-2	0	3	2	2	0	-4	-2	-3	-0.92	-0.76	-1.80	-1.25	-0.33
Feasibility – Hazard Mitigation Effectiveness	3	-4	1	1	1	4	-2	-4	0	-4	-4	-2	-2	1	0	-2	0	0	4	2	2	0	-4	3	1	-0.20	0.06	-1.20	-0.75	0.00
Feasibility - Adaptability	-1	-4	-4	-3	0	4	-4	-4	-4	-4	-4	-2	-2	1	0	-4	0	-4	3	2	0	0	-4	-1	1	-1.52	-1.06	-2.20	-2.50	-3.00
Feasibility – Prior Experience	0	-3	4	-2	2	4	1	-4	-4	-4	-2	0	-2	-1	0	-2	0	-2	3	0	-2	0	-4	1	1	-0.64	-0.53	-1.60	-0.88	0.33

Management Option: Farquhar Option 4: Dredging to form Lake behind closed beach berm

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	-1	-3	-2	-2	-2	1	-4	-4	-4	-4	-4	0	-2	-4	-3	-4	-4	-4	-4	-4		0	-4		-4	-2.87	-3.20	-1.80	-2.25	-2.00
Acceptability - Public Access	1	1	0	2	0	1	-1	-4	-2	-2	-4	-2	0	-4	-1	0	0	-2	-4	-4		0	-2		-3	-1.30	-2.00	-0.60	0.00	0.67
Acceptability – Community Benefits	0	-1	0	0	0	1	-2	-4	-4	-4	-4	0	-2	-4	-2	-2	0	0	-4	-4		0	2		-2	-1.57	-2.20	-0.20	-0.38	-0.33
Acceptability – Risk Abatement	0	-4	1	1	-1	1	-2	-4	-2	-4	-4	-2	-2	-4	0	-2	0	-4	-4	-4		0	-2		-4	-2.00	-2.47	-1.20	-1.13	-1.00
Acceptability - Longevity	0	-3	0	-2	-1	1	-3	-4	2	-4	-4	-2	0	-4	-4	-4	0	-4	-4	-4		-2	-2		-4	-2.26	-2.53	-1.60	-1.75	-1.00
Acceptability - Recreation	3	2	1	2	0	1	-2	0	-4	-4	0	0	-2	-4	0	0	0	2	0	0		0	2		-2	-0.22	-0.73	-0.20	0.75	2.00
Acceptability - Suitability	0	-2	0	-2	-1	1	-4	-4	-4	-4	-4	-2	-2	-4	-1	-4	-2	-2	-4	0		0	2		-4	-2.04	-2.67	-0.40	-0.88	-0.67
Acceptability - Governance	0	1	0	0	0	1	0	-4	0	-4	-4	-2	-2	-4	-1	-2	0	2	0	0		0	0		-3	-0.96	-1.27	-0.60	-0.38	0.33
Fairness - Cultural and Social Values	1	-2	0	0	0	0	-3	-4	0	-4	-4	-2	-2	-4	0	-2	0	-2	0	0		0	-2		-3	-1.43	-1.73	-1.20	-0.88	-0.33
Fairness - Equity	0	-4	-1	0	1	1	-2	-4	2	-4	-4	0	-2	-4	0	-2	0	0	0	0		0	-4		-2	-1.26	-1.13	-1.20	-1.50	-1.67
Fairness – Sustainability and Resilience	1	1	0	1	0	1	-4	-4	-2	-4	-4	-2	-2	-4	0	-4	0	0	-4	0		0	-4		-4	-1.65	-2.20	-1.40	-0.63	0.67
Fairness – Aboriginal Peoples	0	-3	-1	1	0	0	-4	0	0	-4	0	0	-2	-4	0	-4	0	-2	0	0	0	0	0	0	-4	-1.08	-1.18	-0.80	-0.88	-1.33
Fairness – Risks, Hazards, and Safety	0	-4	0	1	0	-4	-2	-4	-4	-4	-2	-2	-2	-4	-1	-4	0	-2	-4	0	-2	0	-4	0	-4	-2.08	-2.41	-2.40	-1.38	-1.33
Feasibility - Achievability	-4	-4	-2	-1	1	-4	-4	-4	-4	-4	-4	-4	-2	-4	0	0	2	2	-4	0	0	0	-4	1	-4	-2.04	-1.94	-2.20	-2.25	-3.33
Feasibility – Environmental Effectiveness	0	-3	-2	-2	-1	-4	-1	-4	-4	-4	-4	-2	-2	-4	1	-4	0	-4	-4	0	0	0	-4	-2	-4	-2.32	-2.47	-2.60	-2.00	-1.67
Feasibility – Hazard Mitigation Effectiveness	0	-4	0	1	0	-4	-1	-4	0	-4	-4	-2	-2	-4	1	-2	0	0	-4	0	-2	0	-4	0	-4	-1.72	-1.88	-2.40	-1.38	-1.33
Feasibility - Adaptability	0	-3	-4	1	0	-4	-2	-4	-4	-4	-4	-4	-2	-4	1	-4	0	-4	-4	0	-2	0	-4	-1	-4	-2.40	-2.71	-2.40	-1.75	-2.33
Feasibility – Prior Experience	-1	-4	-2	-3	1	-4	-2	-4	-4	-4	-4	0	-2	-4	2	-2	2	-2	-4	0	-2	0	-4	0	-4	-2.04	-2.00	-2.20	-2.13	-2.33

Management Option: Mitchells Island Option 2: 'Soft' Foreshore Options

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	4	1	2	2	2	0	2	1	4	1	2	0	0	2	3	2	2	0	2	2		-2	2		3	1.61	1.67	1.00	1.50	2.33
Acceptability - Public Access	4	2	0	1	2	0	2	0	2	1	2	-4	0	2	2	2	2	-4	0	2		-2	2		3	0.91	0.73	0.80	1.25	2.00
Acceptability – Community Benefits	4	2	1	1	3	0	1	0	0	1	4	0	0	2	2	2	0	2	3	2		-2	2		3	1.43	1.40	1.00	1.50	2.33
Acceptability – Risk Abatement	0	1	1	1	1	0	1	1	4	1	2	0	0	2	0	0	0	-4	2	2		-2	2		-1	0.61	0.60	0.60	0.63	0.67
Acceptability - Longevity	0	-3	0	-2	1	0	1	0	4	1	2	0	0	2	1	0	0	-4	1	0		-2	-4		-4	-0.26	0.20	-1.20	-1.13	-1.00
Acceptability - Recreation	2	2	0	1	3	0	2	0	2	3	4	0	0	0	2	2	2	-4	2	0		-2	0		2	1.00	0.93	1.00	1.13	1.33
Acceptability - Suitability	4	4	0	3	4	0	2	-1	4	3	4	0	0	1	2	0	2	-2	2	0		-2	0		3	1.43	1.13	1.60	2.00	2.67
Acceptability - Governance	1	4	1	1	1	0	1	0	2	2	4	0	0	1	2	0	0	2	2	0		-2	0		2	1.04	1.07	0.40	1.00	2.00
Fairness - Cultural and Social Values	4	4	0	1	3	0	1	0	0	3	4	0	0	1	0	0	0	-2	0	0		-2	2		2	0.91	0.40	1.40	1.88	2.67
Fairness - Equity	3	2	2	1	2	0	2	-1	4	3	2	0	0	2	2	0	0	0	2	0		-2	2		2	1.22	1.00	1.20	1.63	2.33
Fairness – Sustainability and Resilience	4	3	1	2	2	0	1	2	-2	2	2	0	0	1	2	-2	0	0	1	0		-2	2		2	0.91	0.47	1.20	1.75	2.67
Fairness – Aboriginal Peoples	0	2	0	2	2	0	2	0	0	2	0	0	0	1	0	2	0	0	0	0	0	-2	0	0	2	0.52	0.41	0.80	0.75	0.67
Fairness – Risks, Hazards, and Safety	0	-3	1	1	1	2	1	1	4	1	2	0	0	1	-1	-2	0	-2	2	2	-2	-2	2	2	1	0.48	0.65	0.60	0.13	-0.67
Feasibility - Achievability	2	3	3	3	4	2	1	-2	4	1	-4	0	0	1	0	-2	2	0	2	2	2	-2	2	1	3	1.12	0.71	1.60	2.00	2.67
Feasibility – Environmental Effectiveness	2	2	0	2	2	2	1	-4	4	2	2	0	0	1	1	2	0	-4	2	2	2	-2	4	0	1	0.96	0.71	1.60	1.50	1.33
Feasibility – Hazard Mitigation Effectiveness	0	0	1	1	1	2	2	1	4	1	2	-2	0	1	1	-2	0	-4	2	0	0	-2	2	1	-2	0.40	0.35	0.60	0.50	0.33
Feasibility - Adaptability	0	3	2	3	3	2	1	0	4	2	-4	0	0	1	1	-2	0	2	-1	0	0	-2	4	1	2	0.88	0.41	2.00	1.88	1.67
Feasibility – Prior Experience	0	3	4	1	2	2	2	1	2	2	0	0	0	1	2	-2	2	2	-1	0	-2	-2	2	0	2	0.92	0.65	1.00	1.50	2.33

Management Option: Manning Point Option 2: Beach Scraping, Nouirishment and Dune Management

Salients

Criteria	Respondee #1	Respondee #2	Respondee #3	Respondee #4	Respondee #5	Respondee #6	Respondee #7	Respondee #8	Respondee #9	Respondee #10	Respondee #11	Respondee #12	Respondee #13	Respondee #14	Respondee #15	Respondee #16	Respondee #17	Respondee #18	Respondee #19	Respondee #20	Respondee #21	Respondee #22	Respondee #23	Respondee #24	Respondee #25	All Respondents	Community	Agencies	Agencies/Study Team	Study Team
Acceptability - Ecosystems	0	2	2	3	2	4	3	1	2	2	2	0	0	-1	3	2	2	0	2	2		4	2		1	1.74	1.53	2.60	2.13	1.33
Acceptability - Public Access	0	3	0	2	2	4	2	0	2	2	2	0	0	1	2	2	2	0	0	2		4	2		1	1.52	1.33	2.40	1.88	1.00
Acceptability – Community Benefits	2	2	1	2	3	4	2	0	0	2	4	0	0	1	2	2	0	2	3	2		4	2		1	1.78	1.53	2.60	2.25	1.67
Acceptability – Risk Abatement	3	1	1	1	1	4	1	0	4	2	2	0	0	1	0	2	0	-4	2	2		4	-2		-1	1.04	0.87	1.20	1.38	1.67
Acceptability - Longevity	2	-3	0	1	1	4	1	0	4	1	2	0	0	1	1	0	0	-4	1	0		4	-4		-2	0.43	0.53	0.60	0.25	-0.33
Acceptability - Recreation	2	3	0	2	3	4	1	0	2	3	4	2	0	1	2	2	2	-4	2	2		4	0		2	1.70	1.47	2.40	2.13	1.67
Acceptability - Suitability	4	4	0	3	4	4	2	-1	4	3	4	2	0	2	2	2	2	-2	2	0		4	0		-3	1.83	1.33	2.80	2.75	2.67
Acceptability - Governance	1	3	1	1	1	4	1	0	2	2	4	2	0	1	2	2	0	2	2	0		4	0		1	1.57	1.53	1.60	1.63	1.67
Fairness - Cultural and Social Values	1	4	0	2	3	0	2	0	0	3	4	-2	0	1	0	2	0	0	0	0		4	2		0	1.13	0.47	2.80	2.38	1.67
Fairness - Equity	2	2	2	1	2	4	1	-1	4	3	2	0	0	1	2	0	0	0	2	0		4	2		2	1.52	1.13	2.40	2.25	2.00
Fairness – Sustainability and Resilience	2	3	2	2	2	4	2	2	-2	2	2	2	0	2	2	-2	0	0	1	0		4	2		1	1.43	0.93	2.40	2.38	2.33
Fairness – Aboriginal Peoples	0	2	0	2	2	0	3	0	0	2	0	0	0	0	0	2	0	0	0	0	0	4	0	0	2	0.76	0.41	2.00	1.50	0.67
Fairness – Risks, Hazards, and Safety	2	-3	1	1	1	4	2	1	4	2	2	2	0	1	-1	2	0	-2	2	2	2	4	2	2	-3	1.20	1.18	2.00	1.25	0.00
Feasibility - Achievability	4	3	0	2	4	4	2	-2	4	2	-4	-2	0	1	0	-4	2	0	2	2	2	4	2	1	2	1.24	0.59	2.80	2.63	2.33
Feasibility – Environmental Effectiveness	0	2	0	1	2	4	1	-4	4	2	2	-2	0	1	1	-4	0	-4	2	2	2	4	4	0	-3	0.68	0.12	2.60	1.88	0.67
Feasibility – Hazard Mitigation Effectiveness	3	0	1	1	1	4	2	1	4	1	2	-2	0	1	1	-4	0	-4	2	0	0	4	2	1	-3	0.72	0.29	1.80	1.63	1.33
Feasibility - Adaptability	3	4	3	3	3	4	2	0	4	2	-4	-2	0	1	1	2	0	2	-1	0	0	4	4	1	2	1.52	0.71	3.20	3.25	3.33
Feasibility – Prior Experience	4	3	2	1	3	4	2	-1	2	2	0	0	0	1	2	-4	2	2	-1	0	-2	4	2		1	1.21	0.50	2.40	2.63	3.00

Old Bar MCA : Normalised Scores and Ranks

Acceptability

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	Normalised Score	Rank	Normalised Score	Rank	Normalised Score	Rank
Old Bar Option 2	11	4	4	6	10	6
Old Bar Option 3	17	3	11	5	16	5
Old Bar Option 4	5	7	-13	7	-1	7
Old Bar Option 5	11	4	31	4	17	4
Old Bar Option 6	0	8	-14	8	-4	8
Old Bar Option 7	49	2	63	3	53	2
Old Bar Option 8	11	4	83	2	32	3
Old Bar Option 9	100	1	100	1	100	1

Fairness

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	Normalised Score	Rank	Normalised Score	Rank	Normalised Score	Rank
Old Bar Option 2	-6	6	-12	5	-7	6
Old Bar Option 3	6	4	-12	5	1	5
Old Bar Option 4	-18	8	-32	7	-22	8
Old Bar Option 5	6	4	0	4	5	4
Old Bar Option 6	-11	7	-46	8	-20	7
Old Bar Option 7	33	2	67	3	43	2
Old Bar Option 8	15	3	95	2	38	3
Old Bar Option 9	100	1	100	1	100	1

Feasibility

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	Normalised Score	Rank	Normalised Score	Rank	Normalised Score	Rank
Old Bar Option 2	7	4	60	5	23	5
Old Bar Option 3	3	5	54	6	19	6
Old Bar Option 4	-52	8	-50	8	-52	8
Old Bar Option 5	11	3	80	3	31	2
Old Bar Option 6	-22	7	41	7	-3	7
Old Bar Option 7	14	2	72	4	31	2
Old Bar Option 8	2	6	100	1	31	2
Old Bar Option 9	100	1	98	2	100	1

All Criteria

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	Normalised Score	Rank	Normalised Score	Rank	Normalised Score	Rank
Old Bar Option 2	6	6	14	6	9	6
Old Bar Option 3	10	3	16	5	13	5
Old Bar Option 4	-17	8	-28	8	-20	8
Old Bar Option 5	10	3	35	4	18	4
Old Bar Option 6	-9	7	-8	7	-8	7
Old Bar Option 7	35	2	67	3	44	2
Old Bar Option 8	9	5	91	2	33	3
Old Bar Option 9	100	1	100	1	100	1

Farquhar, Mitchells & Manning MCA : Normalised Scores and Ranks

Acceptability

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**
Farquhar Option 2	34	3	-26	3	8	3
Farquhar Option 3	-37	4	-32	4	-34	4
Farquhar Option 4	-169	5	-41	5	-114	5
Mitchells Island Option 2	77	2	56	2	68	2
Manning Point Option 2	100	1	100	1	100	1

Fairness

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**
Farquhar Option 2	34	3	-8	3	12	3
Farquhar Option 3	-72	4	-25	4	-46	4
Farquhar Option 4	-211	5	-54	5	-125	5
Mitchells Island Option 2	70	2	62	2	66	2
Manning Point Option 2	100	1	100	1	100	1

Feasibility

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**
Farquhar Option 2	33	3	-4	3	9	3
Farquhar Option 3	-116	4	-67	4	-90	4
Farquhar Option 4	-390	5	-79	5	-197	5
Mitchells Island Option 2	100	1	62	2	80	2
Manning Point Option 2	78	2	100	1	100	1

All Criteria

	Community/Unnamed		Agencies/Study Team		All Respondents	
Management Option	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**	**Normalised Score**	**Rank**
Farquhar Option 2	35	3	-14	3	9	3
Farquhar Option 3	-61	4	-42	4	-51	4
Farquhar Option 4	-226	5	-57	5	-137	5
Mitchells Island Option 2	82	2	60	2	70	2
Manning Point Option 2	100	1	100	1	100	1

Appendix C Consultation Reports

Salients and MidCoast Council Old Bar Manning Point Coastal Management Program

Community Engagement Report

SPECTRUM COMMS.

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Executive Summary:

On behalf of MidCoast Council (Council), Salients engaged Spectrum Comms and Micromex to undertake community engagement and analysis to inform the preparation of Council's Old Bar Manning Point Coastal Management Program (CMP).

This brief community engagement report covers engagement and analysis that was undertaken between March and April 2024. The purpose of this engagement was to understand what the community value about the coastline, how they use and enjoy it, and their preferences relating to different management strategies.

Input was provided by Council who undertook a 'Have Your Say' activity where community members were invited to provide input and feedback. This engagement exercise provided information from 106 unique submissions on how coastal areas from south of Crowdy Head to Wallabi Point are used. A local survey was also developed and conducted by Micromex who engaged 85 community respondents from across the MidCoast government area. This report includes an overview of the submissions from these 191 stakeholders and comments. A report prepared by Micromex is provided as Attachment A.

The material in this report is both aspirational and reflective. The information reveals the ways in which residents and visitors use the coastline, what they value and love about it and what they identify as issues or challenges.

Council should reference where community input has influenced the development of the CMP and are encouraged to close the loop to ensure stakeholders understand how their input has helped shaped this important program.

Summary of key values through words: Have Your Say

The following key values, represented in a word cloud, were identified from Council's "Have Your Say" community engagement exercise as part of that exercise, users were able to select a geotagged social pinpoint locations on a mapping interface and leave comments and feedback. The information in Figure 1 is displayed in order of frequency as mentioned throughout the engagement activity and does not necessarily represent all the values across the MidCoast.

Figure 1: Word cloud with common words

Summary of key coastal activities and community use

Have Your Say – mapping exercise

As part of Council's Have Your Say engagement activity, users were encouraged to provide comments on how they use and interact with the coast between Crowdy Head and Wallabi Point. This engagement activity was open for approximately four months (November 2023 – February 2024) and closed on Sunday 18 February 2024.
The categories below are listed in order of most frequently undertaken to least frequently undertaken; the order is as follows:

- Walking or running
- Beach or lagoon swimming
- Fishing
- Dog walking
- Surfing, paddleboarding or kayaking
- Other (whale watching, tennis, exploring, relaxing, volunteering etc.)
- Bird watching
- Picnicking
- Cycling
- Four-wheel driving
- Boating
- Camping

Based on the pinpoint exercise provided by community members, the top three activities of walking or running, beach or lagoon swimming and fishing make up 55% of overall responses. These top three segments represent more than half of the feedback from community members – indicating that these activities are strongly valued. This signifies that strong consideration must be given to these activities and how any changes to the coast may interrupt or inhibit community use.

Figure 2 illustrates broad groupings that highlight the locations in which community members use and interact with the coastline. As part of this exercise, community members were asked to select coastal locations in this region and leave a comment or information. This is unlike the Micromex survey that engaged individuals across the expansive MidCoast region, where respondents provided information directly to facilitators on how they use and interact with coastal regions.

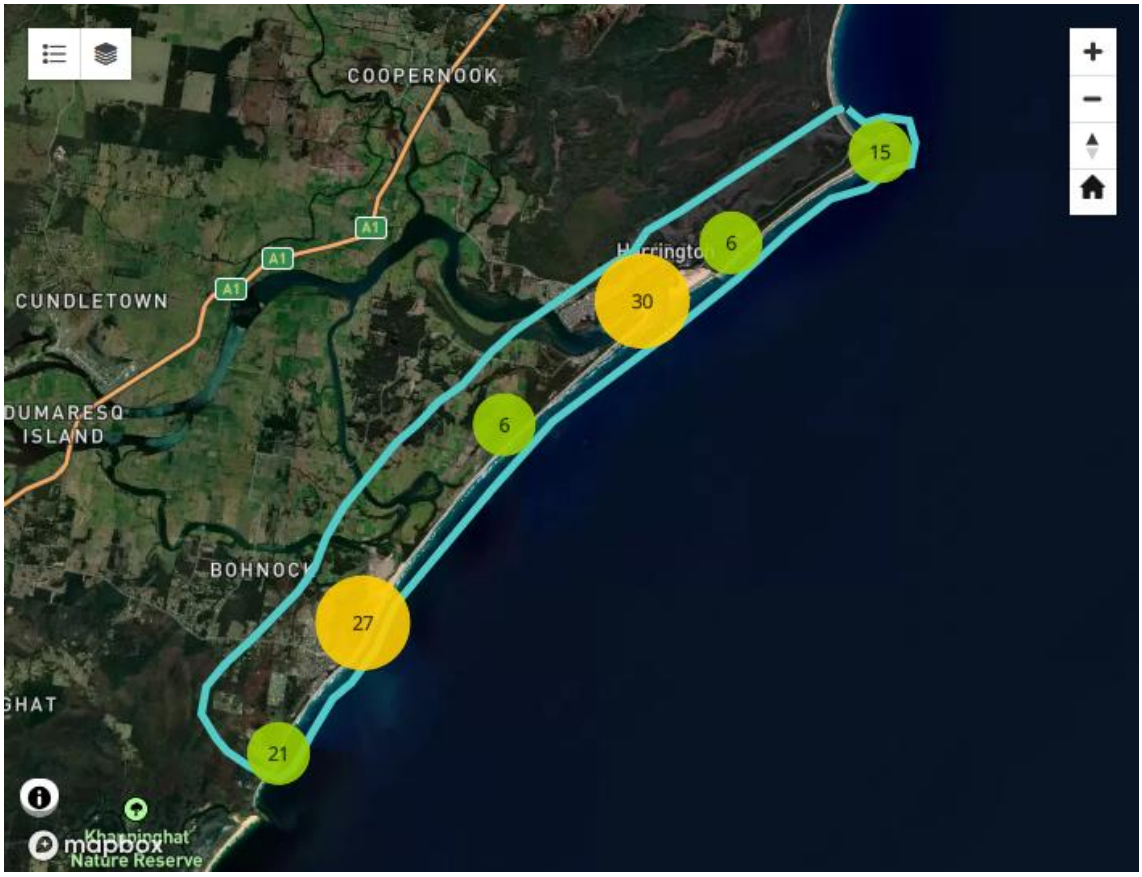

Figure 2: Illustration of the 106 contributions based on location

Independent community survey

An independent community survey was undertaken by Micromex, and this engagement activity was completed from 11 March 2024 until 31 March 2024. During this time, 74 telephone surveys (15 – mobile and 59 – landline) and 11 online surveys were completed, with a final total of 85 respondents. The full survey was completed with participants across the LGA, and the results can be found in Attachment A.

When community members were surveyed, 86% of respondents indicated that they visit coastal locations across the MidCoast at least once a month. Participants were asked how they use and interact with those coastal locations. The categories below are listed in order of most frequently undertaken to least frequently undertaken; the order is as follows:

- Walking or running
- Dog walking
- Bird watching
- Beach or lagoon swimming
- Fishing
- Surfing, paddleboarding or kayaking
- Picnicking
- Cycling
- Boating
- Four-wheel driving
- Camping

Figure 3 illustrates that a diverse cross section of the MidCoast community participated in the community survey. Based on their feedback the two most popular activities were identified and they include walking or running, and dog walking. 39% and 26% of respondents undertake these activities, respectively, at least once every few days, indicating that these activities are greatly valued. This signifies that strong consideration must be given to these activities and how any changes to the coast may interrupt or inhibit community use.

Sample Selection and Profile

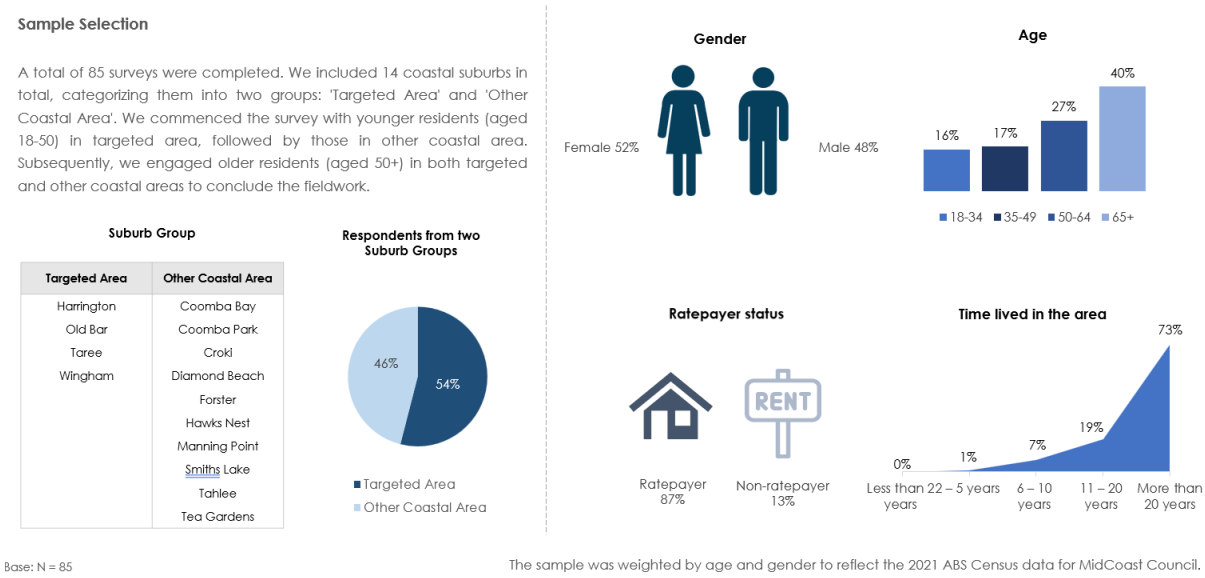

Figure 3: Sample selection and profile for community survey respondents

Analysis:

When comparing data sets from the Have Your Say pinpoint data and the community survey, common trends and rankings are evident across both engagement exercises. Whilst the categories are not definitively ranked the same, the top six segments (apart from the 'other' category in the Have Your Say data) correlate.

This data provides a robust understanding about how broad sections of the community use and interact with these coastal areas. The use profile for the broader MidCoast community, and the community from the coastal strip are well aligned. The most common coastal usage activities are walking or running, beach or lagoon swimming, fishing, dog walking, surfing, paddleboarding or kayaking and bird watching.

It's important to note that there are no barriers of entry for all six of the most frequently undertaken activities. Meaning that any community member is free to interact and engage with the coast, whether that be for a walk or swim. Therefore, any reduction in the ease of access, will heavily impact on all community members.

When reviewing the entire data set, boating, four-wheel driving and camping are the three least frequently undertaken activities across the social pinpoint activity and community survey. This might be due to several factors; however, the most likely reason would be the barrier of entry, equipment and costs associated with these activities.

Despite, the relatively lower value of these activities and the barriers of entry, changes to how the coast is managed, particularly in relation to access, may impact these users.

Summary of other community comments and concerns: Have Your Say

Overall, there were 106 submissions as part of this Have Your Say exercise and 37 of these submissions related to comments that could not be segmented into the defined coastal usage segments as explained in previous sections.

The findings contained in this table below are based broadly on the comments provided by the community and have been categorised accordingly. These categorisations could be used as a source of information and provide feedback on how to maintain and manage and protect coastal locations across the LGA.

Common theme/value	Details
Appreciation of the local environment	There are several comments that highlight the natural beauty and pristine coastline that is present across the LGA. The term littoral rain forest is mentioned across multiple comments with terms like 'beautiful' and 'stunning' – suggesting strong appreciation. Further feedback goes on to show understanding and value for the area with comments like 'keep natural and pristine', and 'amazing wetland and birdlife.' One comment defines this appreciation holistically, 'clean, natural, and underdeveloped location. Enjoy the peacefulness, sand dunes and I hope we can protect the wildlife and fauna including the dunes.'
Coastal views and appreciation	People value their coastal views, both from private property and from community land. These views are appreciated and enjoyed while socialising, exercising, or simply appreciating nature. This is illustrated with comments like 'panoramic views up the coast' and 'the coastline is of extreme value to preserving the wildlife and providing people with recreational activities - a walk, a picnic and a swim.'
Maintenance request and concern – vehicle access	There were several comments addressing concerns over access to and from areas by vehicle, with multiple requests for sealed roads and upgrades. Community members are very interested in accessing many locations but have concerns about potential access that may restrict some vehicles. Without firsthand information to confirm, this could be due to large potholes or undulations, 4WD requirements, tracks or degraded access paths and general accessibility concerns.
Maintenance request and concern – pedestrian access	The comments provide information on how pedestrian access is seen and valued throughout coastal regions. There are comments that relate to pedestrian accessibility with concerns over how access is maintained, facilitated and what can be improved.

	This is showcased through comments like 'improve accessibility from village,' 'improve ... accessibility footpath,' 'whale viewing platform ... along the track,' 'fix the track and obnoxious weeds,' '...ramp for all access,' and 'install accessibility footpath.'
Maintenance request and concern – public amenities	The comments provide information on how locations are used and what community members would like to see improved to increase enjoyment/appeal. Feedback relates to the presence and availability of public amenities and include comments like 'improve public toilets ... parking,' 'install more picnic tables,' 'install picnic areas ... and a shark net ... for a wonderful tourist attraction,' and 'install break wall to keep river open, encourage tourism of boat owners for sea fishing and add a new boat ramp.'
Community concern – 4wd vehicle access	The comments provide information on how community members feel towards the presence of vehicles, especially four-wheel drives in and around coastal areas. There is feedback that clearly expresses community concern about how vehicles are being operated and viewed across the LGA. This is highlighted with comments like 'ban all vehicles driving on the beach,' 'shame the Manning Point 4WD access ... is a highway, unsafe for families with vehicles doing far more than the legal limit,' 'a permanent vehicle free zone is needed at Manning Point, no longer use beach because of traffic,' and 'drivers on the beach do not adhere to speed limits or space requirements.'

Coastal management strategy and community sentiment – summary from community survey

In the second section of the of the independent community survey that was undertaken by Micromex, respondents were asked about their level of perceived importance and concerns towards elements of the current coastal management strategy.
Respondents were prompted with 6 statements from the current strategy which included:

- Protecting the coast's natural processes and ecosystems
- Maintaining public access and use
- Supporting community participation and education around coastal management
- Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events
- Acquiring land to protect, enhance and restore the coastal zone
- Acknowledging Aboriginal peoples' cultural, social and economic use of the area

'Protecting the coast's natural processes and ecosystem' and 'maintaining public access and use' received the highest importance scores and concern scores across the 6 current strategy statements. More than 90% of respondents rated them as important/very important, and more than 80% rated them as concerned/very concerned.

This continues to highlight the trend from the data in earlier sections of this report, community members have a strong focus on protecting the coastline, whilst also wanting to maintain access and use.

Coastal management strategy and erosion management options – summary from community survey

In the third section of the of the independent community survey that was undertaken by Micromex, respondents were asked about their level support that related to four different management options. The management options available to Council to address the potential erosion between now and 2100 include:

- Take no action
- Managed retreat
- Short term solutions
- Long term options

The long-term option is the most preferred outcome among all four options, with nearly half (48%) stating it as their preference. However, taking no action received the lowest level of support (7%).

The widespread community support for long-term options highlights the strong appreciation that respondents hold towards the coastal areas across the MidCoast. Community members would like to see action from Council and relevant organisations to consider long term solutions that will protect these coastal areas.

Whilst this information is both reflective and aspirational, further exploration will be required to understand how long-term options will be valued once in place. Long term options can include hard engineering structures such as revetments walls, seas walls, groynes, and artificial reefs. The establishment of such engineering structures will likely protect the coast's natural processes and ecosystems and will support the community sentiment outlined in section two of survey data. Contrary to this progress in maintaining coastal areas, long term options may also heavily impact access and use of these locations. This may challenge community sentiment outlined in section 2 of the community survey, where respondents are in strong support of maintaining public access and use.

In addition to this overview of the survey, it is strongly recommended that the full community survey report and subsequent data is reviewed to further shape understanding. The report is available in Attachment A.

Attachment A

Micromex Research – MidCoast Council Coastal Management Community Survey

MidCoast Council

Coastal Management Community Survey

Prepared by: Micromex Research
Date: April 2024

micromex research

MIDCOAST council

Report Outline

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micromex research

MIDCOAST council

Research Objectives

MidCoast Council commissioned Micromex Research to conduct a further telephone survey with residents who participated in previous community satisfaction surveys in MidCoast Council LGA. The purpose was to obtain resident feedback about a range of coastal management options being considered for Old Bar, Manning Point, and elsewhere along the coast. Alternatively, residents could also use an online survey link to self-complete the survey if they preferred.

Why?

- Understand the interaction between residents and coastal areas, including the activities residents typically engage in and the frequency of those activities
- Examine the level of priority and concern among residents regarding the current coastal management strategy
- Assess community support for 4 different management options

How?

- Telephone survey (landline N=15 and mobile N=59) to 74 residents
- Online survey to 11 residents

When?

- Fieldwork was conducted between 11th and 31st March.

Interviewing

Interviewing was conducted in accordance with The Research Society Code of Professional Behaviour.

Data analysis

The data within this report was analysed using Q Professional.

Within the report, blue and red font colours are used to identify statistically significant differences between groups, i.e., age and target area.

Significance difference testing is a statistical test performed to evaluate the difference between two measurements. To identify the statistically significant differences between the groups of means, 'One-Way Anova tests' and 'Independent Samples T-tests' were used. 'Z Tests' were also used to determine statistically significant differences between column percentages.

Note: All percentages are calculated to the nearest whole number and therefore the total may not exactly equal 100%.

Sample Selection and Profile

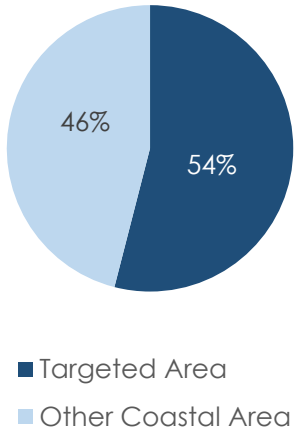
Sample Selection

A total of 85 surveys were completed. We included 14 coastal suburbs in total, categorizing them into two groups: 'Targeted Area' and 'Other Coastal Area'. We commenced the survey with younger residents (aged 18-50) in targeted areas, followed by those in other coastal areas. Subsequently, we engaged older residents (aged 50+) in both targeted and other coastal areas to conclude the fieldwork.

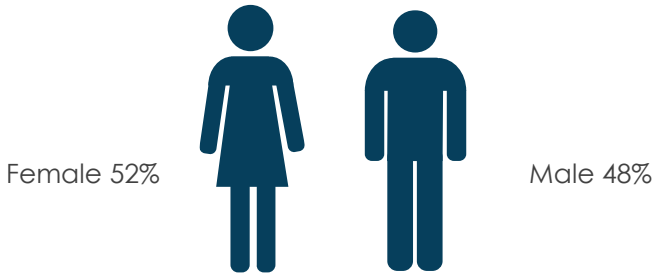
Suburb Group

Targeted Area	Other Coastal Area
Harrington	Coomba Bay
Old Bar	Coomba Park
Taree	Croki
Wingham	Diamond Beach
	Forster
	Hawks Nest
	Manning Point
	Smiths Lake
	Tahlee
	Tea Gardens

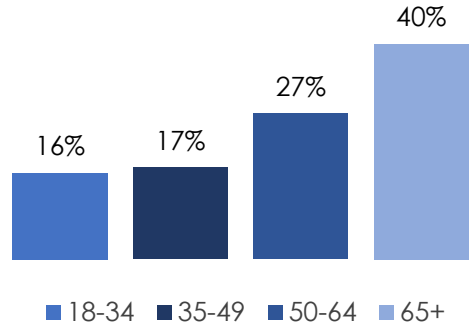
Respondents from two Suburb Groups



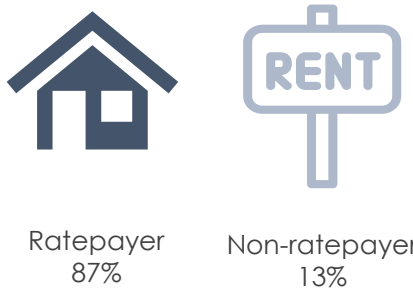
Gender



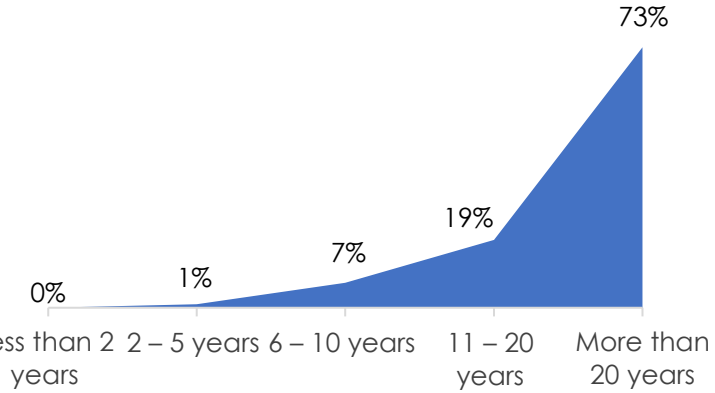
Age



Ratepayer status

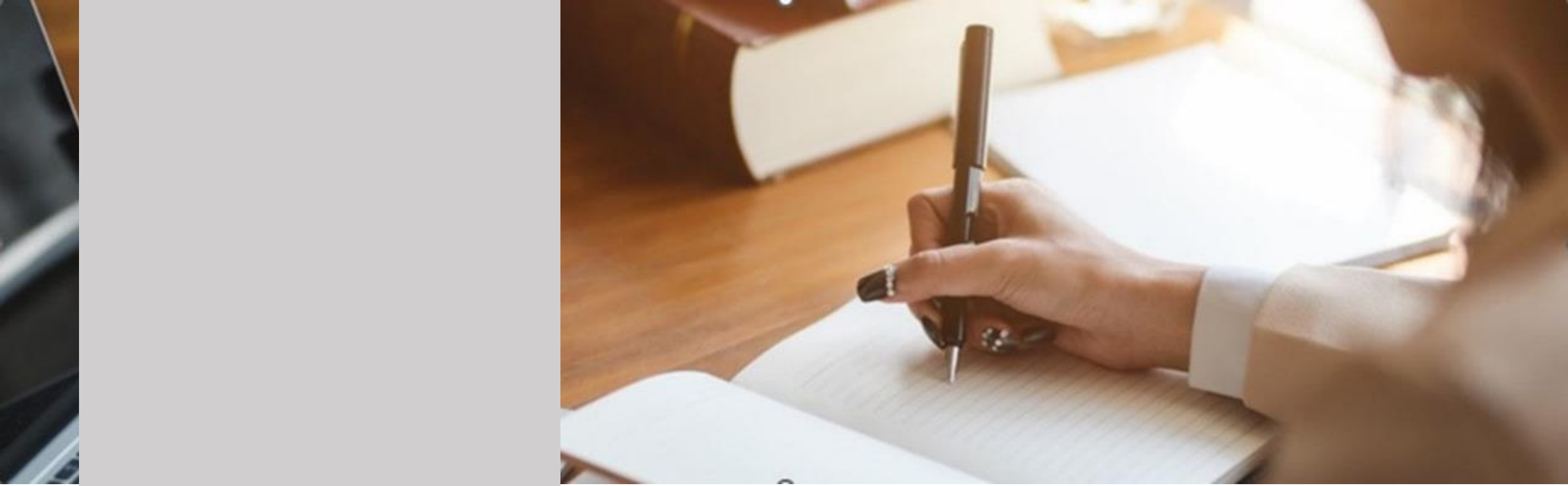


Time lived in the area



Base: N = 85

The sample was weighted by age and gender to reflect the 2021 ABS Census data for MidCoast Council.



Summary Findings

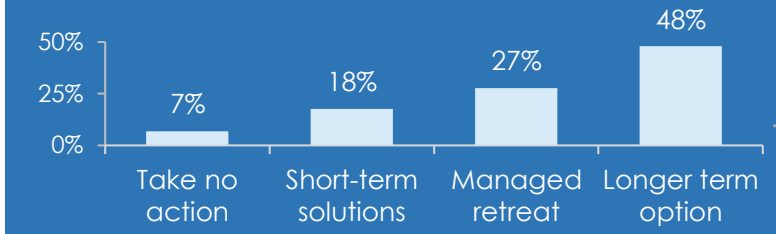
Summary Findings

Approx. 9 in 10 (86%) Coastal residents are undertaking activities in coastal locations at least once a month

'Protecting the coast's natural processes and ecosystem' and 'maintaining public access and use' received the highest importance scores and concern scores across the 6 current coastal management strategy statements

Coastal management statements (Mean rating)	Importance	Concern
Protecting the coast's natural processes and ecosystems	4.66	4.41
Maintaining public access and use	4.56	4.32
Supporting community participation and education around coastal management	4.36	4.12
Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	4.26	4.07
Acquiring land to protect, enhance and restore the coastal zone	4.08	3.85
Acknowledging Aboriginal peoples' cultural, social and economic use of the area	3.78	3.47

Longer-term option is the most preferred outcome to deal with potential erosion impact



Top 3 Reasons for choosing the Longer-term option:

- Solve the problem properly (e.g. protecting properties)
- Sustainable/ continuous/ good for a long run
- Good value costing

Responsibility for Financing the options:

75% of respondents stated 'State Government' is responsible for financing the erosion management strategies, followed by 'affected residents and landowners' (47%) and 'Local Government via rates and levies' (44%).

Section One

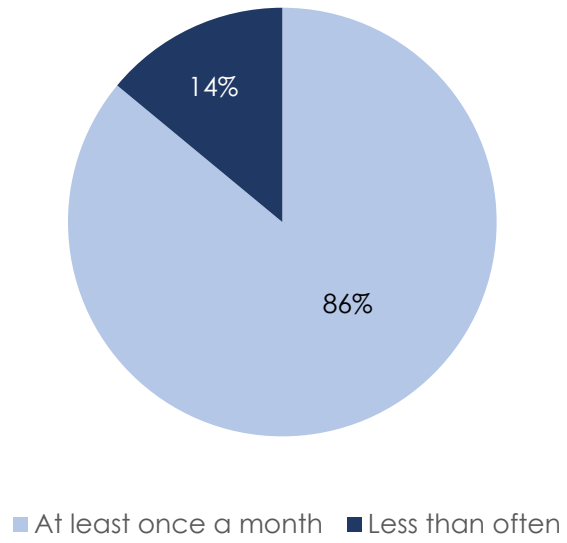
Interaction with Coastal Locations

This section focuses on the activities that residents usually do within the coastal locations, as well as the frequency of doing these activities.

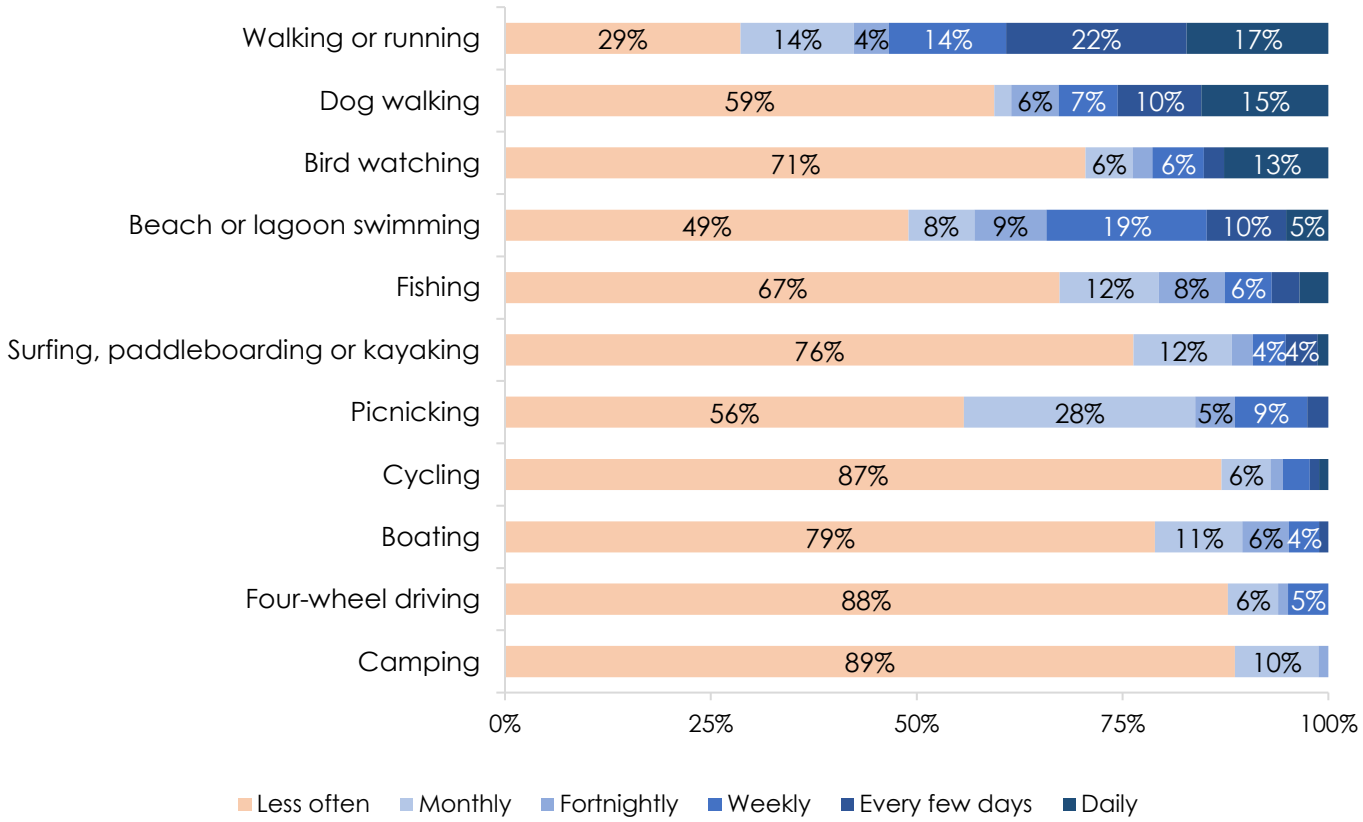
Interaction with Coastal Locations within the LGA

86% of respondents visit coastal locations across the MidCoast LGA at least once a month. The most popular activities centre around walking/running and dog walking, with 39% and 26% undertaking them at least once every few days.

Frequency of visiting the coastal locations



Frequency of undertaking activities*



Nett: Daily/ Every few days
39%
26%
15%
15%
7%
5%
3%
2%
1%
0%
0%

Base: N = 85

Q1. How frequently do you visit coastal locations across the LGA to undertake the following?

*Note: <4% is not shown in the chart, please see Appendix 1 for other activities

Interaction with Coastal Locations within the LGA

Looking across different age groups and locations, although not statistically significant, younger residents (18-49) are more likely to visit coastal locations at least once a month compared to older residents, while those located in other coastal area are more likely to visit coastal areas at least once a month compared to those living in targeted area.

Further, those living in other coastal area are significantly more likely to undertake walking/running and beach/lagoon swimming compared to those living in the targeted area.

Visit Coastal locations	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
At least once a month	86%	89%	94%	82%	85%	81%	93%
Base	85	14	14	23	34	46	39

Undertaking activities (Nett: Daily/Every few days)	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
Walking or running	39%	29%	27%	51%	41%	27%	54%
Dog walking	26%	31%	20%	37%	18%	22%	30%
Bird watching	15%	0%	14%	19%	19%	17%	13%
Beach or lagoon swimming	15%	19%	13%	28%	5%	5%	27%
Fishing	7%	0%	7%	14%	5%	6%	7%
Surfing, paddleboarding or kayaking	5%	9%	0%	14%	0%	2%	9%
Picnicking	3%	0%	0%	10%	0%	2%	3%
Cycling	2%	0%	0%	8%	0%	0%	5%
Boating	1%	0%	0%	4%	0%	0%	2%
Base	85	14	14	23	34	46	39

Base: N = 85

Q1. How frequently do you visit coastal locations across the LGA to undertake the following

Significantly higher / lower percentage (by group)

Section Two

Current Coastal Management Strategy

This section examines the level of priority and concern among residents regarding 6 statements from the current coastal management strategy.

The Importance and Concerns Regarding the Current Coastal Management Strategy

'Protecting the coast's natural processes and ecosystem' and 'maintaining public access and use' received the highest importance scores and concern scores across the 6 current strategy statements. More than 90% of respondents rated those two as important/very important, and more than 80% were concerned/very concerned about them.

The hierarchical sorting of each graph is relative to the statements' importance mean ratings

Please see Appendix 1 for results by demographics

Base: N = 85

Scale: 1 = not at all important/concerned, 5 = very important/concerned

Q2. *When it comes to coastal management, on a scale of 1-5 where 1 is not at all important and 5 is very important, how important are the following considerations?*

Q3. *Thinking about the same considerations on a scale of 1-5 where 1 is not at all concerned and 5 is very concerned how concerned are you with the following?*

Section Three

Concept Statement of Erosion Management Options

This section assesses community support for 4 different management options available to the Council to address potential erosion between now and 2100. It also gauges residents' attitudes regarding the responsibility of different parties for financing the management options.

Introduction of Concept Statement

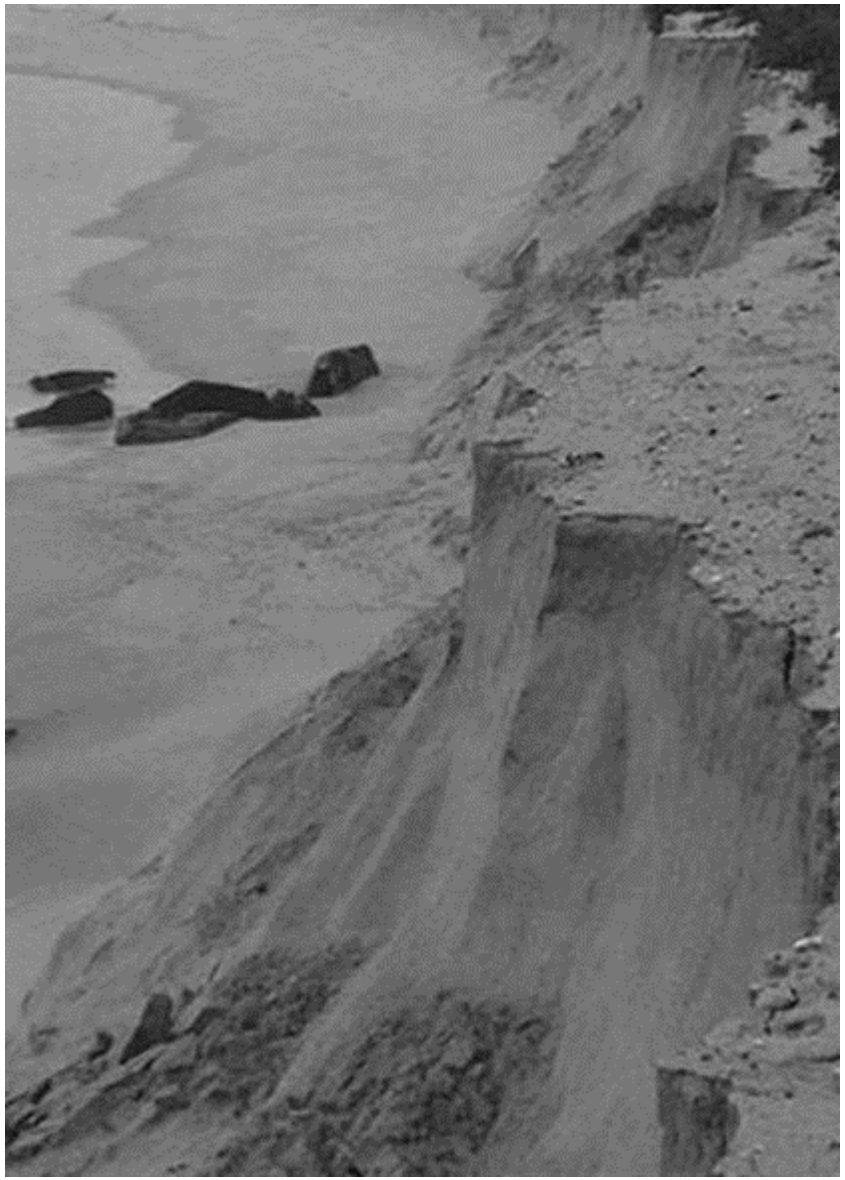
The background and concept of erosion management across the coastal locations in the MidCoast LGA were presented to the respondents before they answered the questions in this section.

Concept Statement

Coastal Erosion Hazard mapping for the area suggests that the coastline will be significantly affected by coastal erosion with a number of properties in Old Bar and Manning Point impacted between now and 2100.

There is a range of different management options that are available to Council.

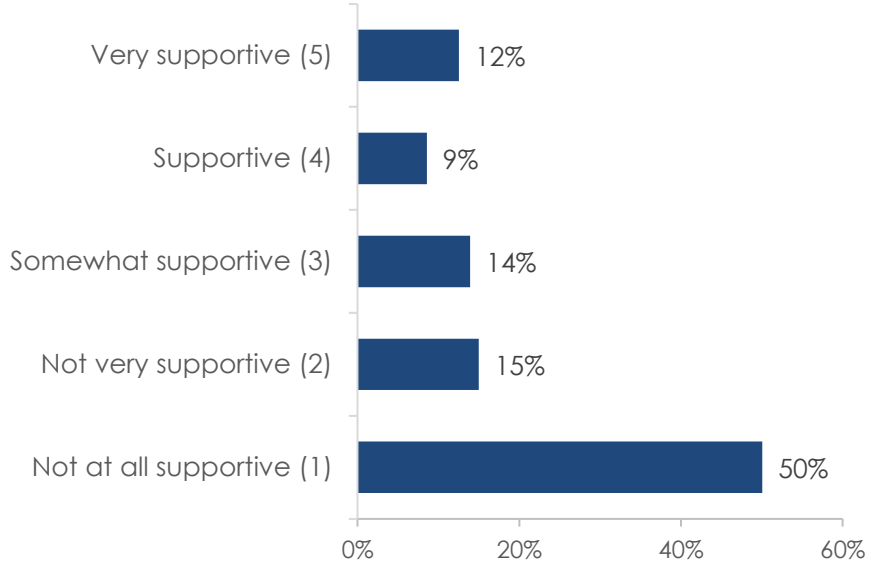
This survey will seek to measure community support for these management options.
Take no action
Managed retreat which accepts the inevitable loss of properties, assets and infrastructure and responding to changes when certain things happen such as the loss or damage of a building, road or sewer network.
Short- term options like dune stabilisation, beach nourishment or the use of very large, sand-filled bags. These actions may slow down the erosion but properties, assets and infrastructure will still be lost.
Longer-term options against coastal erosion by constructing hard engineering structures such as revetment walls, sea walls, groynes and artificial reefs.



Management Option 1 – Take No Action

Only 35% of respondents were at least somewhat supportive of taking no action towards potential erosion impact, and half of them were not at all supportive.

By age, older residents (65+) appear to be more likely to support this conservative option, with 44% of them being at least somewhat supportive.



Take no action

The advantages of this management option are:

- Status quo
- No upfront cost
- Coastal environment/qualities remain intact

The disadvantages of this management option are:

- Leads to reactive interventions
- Critical infrastructure will be damaged or lost
- Unpredictable consequences
- May impact wider community (i.e. failed infrastructure)
- Reputational damage

	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
T3B%	35%	28%	39%	23%	44%	34%	36%
Mean rating	2.19	1.56	2.37	2.03	2.46	2.15	2.23
Base	85	14	14	23	34	46	39

Base: N = 85

Q4. How supportive are you of this management option?

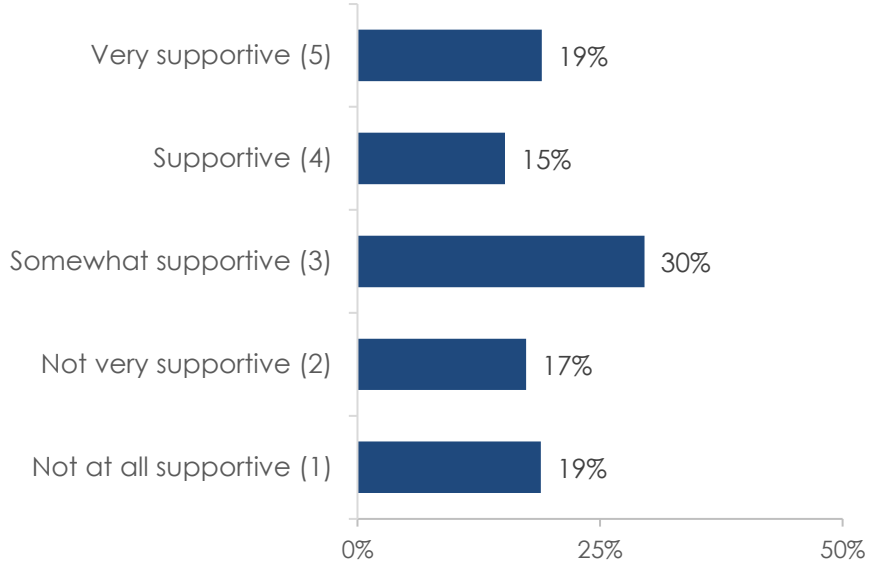
Significantly higher / lower percentage/rating (by group)

Scale: 1 = not at all supportive, 5 = very supportive

Management Option 2 – Managed Retreat

64% of respondents were at least somewhat supportive of conducting the managed retreat option to deal with potential erosion impact.

There is no significant difference across age groups and locations.



Managed retreat

Managed retreat is the acceptance of the loss of properties, assets and infrastructure but it is planned to minimise the impact of this on the community. Losses and damage are anticipated, and triggers, thresholds or other mechanisms are used to initiate an action.

The advantages of this management option are:

- Loss of properties, assets and infrastructure are anticipated and planned for
- Contingencies are put in in place to address damage or loss
- Community anticipate impact and are better prepared
- Roles and responsibilities are stated and understood
- Coastal environment/qualities remain intact

The disadvantages of this management option are:

- Property, assets, and infrastructure are lost
- Highly political at the point of impact
- Does not guarantee that reactive interventions won't occur

	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
T3B%	64%	59%	66%	59%	68%	64%	64%
Mean rating	2.98	2.57	3.21	2.86	3.12	2.96	3.00
Base	85	14	14	23	34	46	39

Base: N = 85

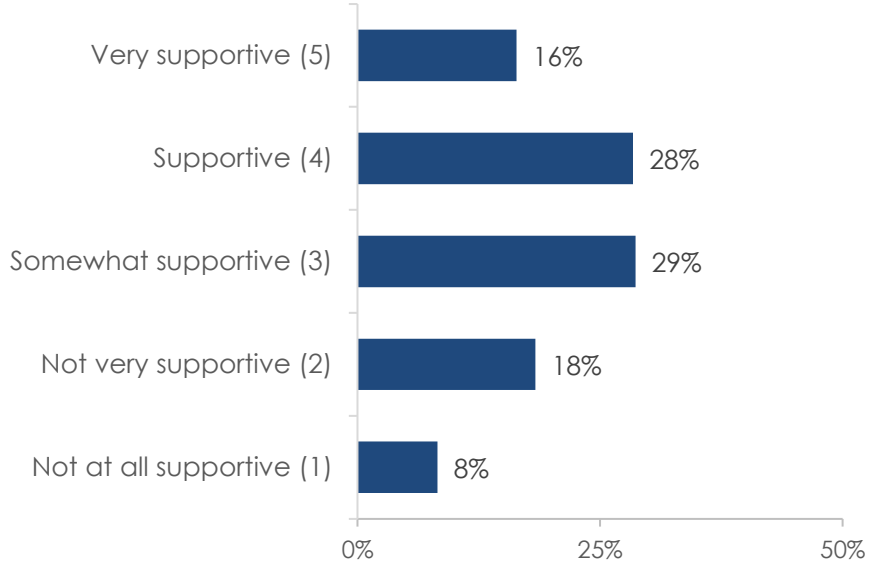
Q5. How supportive are you of this management option?

Scale: 1 = not at all supportive, 5 = very supportive

Management Option 3 – Short-term Solutions

73% of respondents were at least somewhat supportive of the short-term solutions.

Demographically, support for short-term solutions tends to increase with age, with those in the 65+ age group significantly more likely to support such measures.



Short-term solutions

Short-term solutions like dune stabilisation, creating sand buffers, beach nourishment and large, sand filled bags may help protect against small to medium erosion events but are unlikely to provide any enduring protection against large events. Properties, assets and infrastructure will still be damaged and lost.

The advantages of this management option are:

- Relatively low-impact interventions without enduring changes to the coastal environment.
- Relatively low cost when compared to hard engineering options.
- Extends use and occupation of properties.
- Provides additional time to adapt.

The disadvantages of this management option are:

- Moderate expense.
- Ongoing maintenance costs.
- Changes to the coastal environment
- May result in changes to amenity and access
- Unintended consequences of actions

	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
T3B%	73%	61%	66%	73%	82%	73%	73%
Mean rating	3.26	2.73	3.17	3.10	3.62	3.09	3.47
Base	85	14	14	23	34	46	39

Base: N = 85

Q6. *How supportive are you of this management option?*

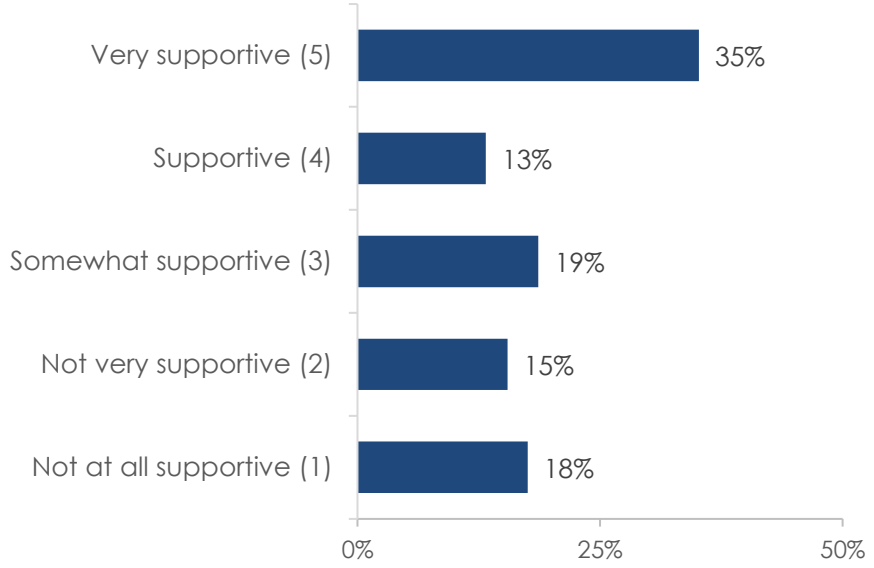
Significantly higher / lower percentage/rating (by group)

Scale: 1 = not at all supportive, 5 = very supportive

Management Option 4 – Longer-term Options

67% of respondents were at least somewhat supportive of the longer-term options.

By location, those located in other coastal areas were more likely to be supportive of the longer-term options compared to those living in targeted areas.



Longer-term options

Longer-term options against coastal erosion via the construction of hard engineering structures such as revetment walls, sea walls, groynes and artificial reefs.

The advantages of this management option are:

- Most enduring defence against coastal processes

The disadvantages of this management option are:

- High expense
- Ongoing maintenance costs
- Changes to the coastal environment
- Loss of amenity and access (e.g. loss of beach)
- Unintended consequences of actions
- Locks in an adaption pathway
- Intergenerational burden to maintain or remove intervention

	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
T3B%	67%	63%	61%	64%	73%	63%	72%
Mean rating	3.33	3.37	2.88	3.26	3.55	3.14	3.56
Base	85	14	14	23	34	46	39

Base: N = 85

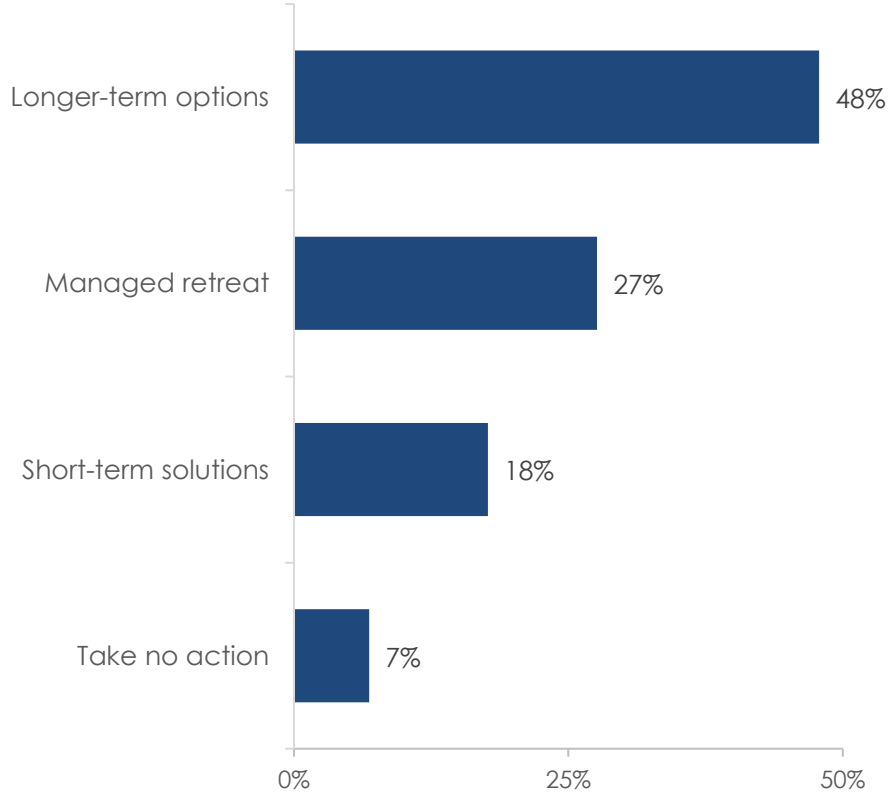
Q7. How supportive are you of this management option?

Scale: 1 = not at all supportive, 5 = very supportive

Preferred Outcome

The 'longer-term options' is the most preferred outcome among all four options, with nearly half (48%) stating it as their preference. Taking no action received the lowest level of support (7%).

Demographically, younger residents and those living in the targeted area appeared to be more supportive of managed retreat but objected to short-term solutions and taking no action.



	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
Longer-term options	48%	41%	55%	45%	49%	48%	47%
Managed retreat	27%	48%	45%	22%	16%	34%	20%
Short-term solutions	18%	11%	0%	18%	28%	12%	25%
Take no action	7%	0%	0%	14%	7%	6%	8%
Base	85	14	14	23	34	46	39

Base: N = 85

Q8. Which one of these is your preferred outcome?

Significantly higher / lower percentage (by group)

Reasons for Preferred Outcome

Based on an open-ended question asking for the reasons for selecting each option, 37% of residents stated that longer-term options would properly address the erosion problem, while 28% stated that it is a sustainable and continuous option, and it is also beneficial for the future. The most common reasons for choosing 'managed retreat' centred on the inevitable damage and lower cost, while residents who chose 'take no action' also cited similar reasons. However, residents who chose short-term solutions stated that it would minimise damage to properties and people, and they need a quicker implementation to address the erosion impact.

Longer-term Options (48%)	Total
Solve the problem properly (e.g. protecting properties)	37%
Sustainable/ continuous/ good for a long run	28%
Good value costing	6%

Managed Retreat (27%)	Total
Can't fight against the nature/ erosion is inevitable	15%
Save money/ minimising cost	13%
People living near the coastline should pay for it themselves	12%
Less impact on the environment	11%
Less impact on the community	7%

Short-term Solutions (18%)	Total
Less damage to the properties/ people	9%
Important to take action quickly	8%

Take no action (7%)	Total
Save money/ minimising cost	4%
Can't fight against the nature/ erosion is inevitable	3%

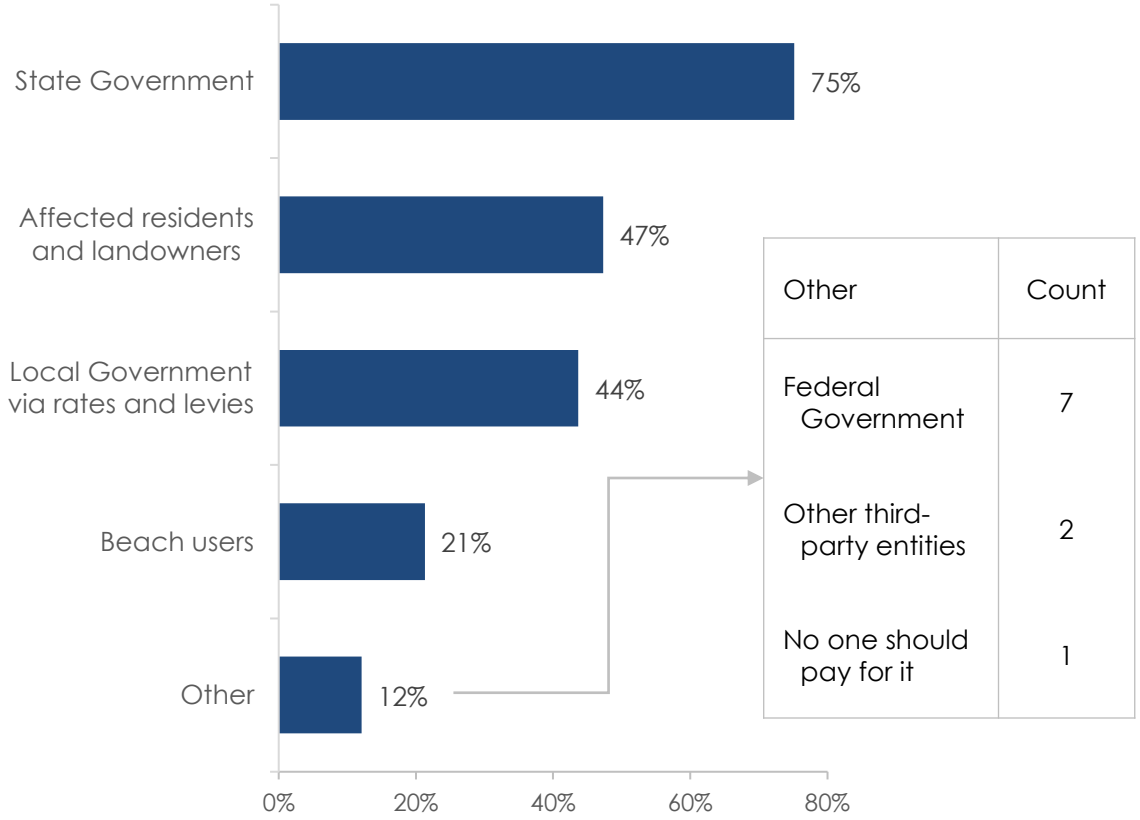
Base: N = 85

Q8. Which one of these is your preferred outcome?
Q9. Why do you say that?

Please see Appendix 1 for full lists of results

Responsibility for Financing the Management Options

When asked about who is responsible for paying for the management options, 75% of respondents stated 'State Government', followed by 'affected residents and landowners' (47%) and 'Local Government via rates and levies' (44%). Older residents (65+) were more likely to state that affected residents and landowners and beach users are responsible for paying the management options.



Other	Count
Federal Government	7
Other third-party entities	2
No one should pay for it	1

	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
State Government	75%	71%	81%	73%	76%	70%	82%
Affected residents and landowners	47%	29%	40%	46%	58%	45%	50%
Local Government via rates and levies	44%	32%	28%	50%	51%	41%	47%
Beach users	21%	0%	21%	19%	32%	17%	26%
Other	12%	11%	13%	18%	8%	16%	8%
Base	85	14	14	23	34	46	39

Base: N = 85

Q10a. Which of the following should be responsible for paying for the management options?

Additional Analyses

Appendix 1

Interaction with Coastal Locations within the LGA

Other specified (Count)	Less often	Monthly	Fortnightly	Weekly	Every few days	Daily	Total
Coffee Chat	0	2	1	0	2	0	5
Sight seeing	0	0	3	0	0	0	3
Golfing	0	0	0	1	2	0	3
Horse-riding	0	0	1	0	0	0	3
Shell collecting	1	1	0	0	0	0	2
Training/drills for emergency	0	0	0	1	0	0	1
Archery	0	0	0	0	1	0	1
Jet Skiing	0	0	0	0	0	0	1
Cultural events/markets	0	0	0	0	0	0	1
Soccer	0	0	0	1	0	0	1
Aquarobics	0	0	0	0	1	0	1
Hockey	0	0	0	0	1	0	1
Skateboarding	0	0	0	0	0	0	1
Cricket	0	0	0	0	0	0	1
Motorcycling	0	0	0	0	1	0	1

Q1. How frequently do you visit coastal locations across the LGA to undertake the following

The Importance and Concerns Regarding the Current Coastal Management Strategy

Importance T2B %	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
Protecting the coast's natural processes and ecosystems	90%	91%	100%	82%	90%	87%	93%
Maintaining public access and use	93%	100%	87%	87%	98%	94%	93%
Supporting community participation and education around coastal management	82%	91%	81%	74%	85%	81%	84%
Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	82%	71%	81%	86%	85%	84%	80%
Acquiring land to protect, enhance and restore the coastal zone	74%	61%	81%	69%	80%	74%	74%
Acknowledging Aboriginal peoples' cultural, social and economic use of the area	59%	49%	81%	48%	60%	53%	65%
Base	85	14	14	23	34	46	39

Importance Mean rating	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
Protecting the coast's natural processes and ecosystems	4.66	4.43	5.00	4.52	4.70	4.59	4.74
Maintaining public access and use	4.56	4.39	4.54	4.37	4.76	4.49	4.64
Supporting community participation and education around coastal management	4.36	4.41	4.49	4.16	4.41	4.30	4.43
Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	4.26	3.92	4.42	4.23	4.34	4.23	4.29
Acquiring land to protect, enhance and restore the coastal zone	4.08	3.74	4.34	3.81	4.28	4.00	4.18
Acknowledging Aboriginal peoples' cultural, social and economic use of the area	3.78	3.59	4.48	3.40	3.82	3.67	3.91
Base	85	14	14	23	34	46	39

Q2. *When it comes to coastal management, on a scale of 1-5 where 1 is not at all important and 5 is very important, how important are the following considerations?*

Significantly higher / lower percentage/rating (by group)
Scale: 1 = not at all important, 5 = very important

The Importance and Concerns Regarding the Current Coastal Management Strategy

Concern T2B %	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
Protecting the coast's natural processes and ecosystems	87%	91%	87%	87%	85%	83%	91%
Maintaining public access and use	84%	89%	87%	69%	90%	82%	85%
Supporting community participation and education around coastal management	76%	89%	81%	64%	78%	78%	74%
Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	73%	72%	66%	78%	73%	76%	69%
Acquiring land to protect, enhance and restore the coastal zone	62%	32%	87%	60%	64%	63%	60%
Acknowledging Aboriginal peoples' cultural, social and economic use of the area	50%	39%	61%	47%	52%	44%	57%
Base	85	14	14	23	34	46	39

Concern Mean rating	Overall	Age				Suburb	
		18-34	35-49	50-64	65+	Targeted Area	Other Coastal Area
Protecting the coast's natural processes and ecosystems	4.41	4.32	4.47	4.38	4.44	4.27	4.58
Maintaining public access and use	4.32	4.19	4.40	4.10	4.49	4.19	4.49
Supporting community participation and education around coastal management	4.12	4.09	4.27	3.88	4.22	4.03	4.23
Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	4.07	4.05	4.01	3.97	4.18	4.05	4.10
Acquiring land to protect, enhance and restore the coastal zone	3.85	3.34	4.48	3.72	3.87	3.77	3.95
Acknowledging Aboriginal peoples' cultural, social and economic use of the area	3.47	3.09	3.89	3.30	3.56	3.27	3.71
Base	85	14	14	23	34	46	39

Q3. *Thinking about the same considerations on a scale of 1-5 where 1 is not at all concerned and 5 is very concerned how concerned are you with the following?*

Significantly higher / lower percentage/rating (by group)
Scale: 1 = not at all concerned, 5 = very concerned

Reasons for Preferred Outcome

Longer-term Options (48%)	Total
Solve the problem properly (e.g. protecting properties)	37%
Sustainable/ continuous/ good for a long run	28%
Good value costing	6%
Less impact on environment	2%
Should focus on other priorities (e.g. weeds management, roads)	1%
Create jobs	1%
Other	7%

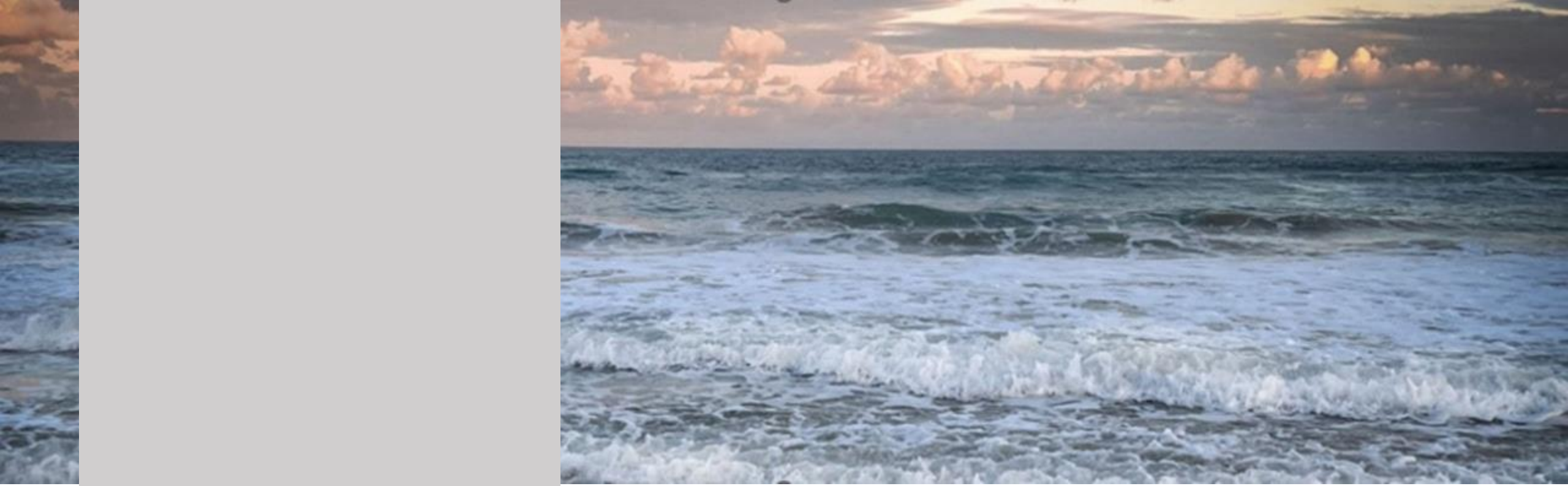
Managed Retreat (27%)	Total
Can't fight against the nature/ erosion is inevitable	15%
Save money/ minimising cost	13%
People living near the coastline should pay for it themselves	12%
Less impact on the environment	11%
Less impact on the community	7%
Should focus on other priorities (e.g. housing, roads)	4%
Keep the access to beaches	3%
Don't care as living far away from coastline	3%
Easy to manage/ conduct	3%
Create jobs	1%
Other	3%

Short-term Solutions (18%)	Total
Less damage to the properties/ people	9%
Important to take action quickly	8%
Need see the short-term performance and update the plan	4%
Less impact on the environment	4%
Council/ Government is responsible for it	2%
Keep the access to beaches	2%
Save money/ minimising cost	2%
Easy to manage/ conduct	2%
People living near the coastline should pay for it themselves	2%
Can't fight against the nature/ erosion is inevitable	1%
Alleviate the impact of climate change	1%
Other	3%

Take no action (7%)	Total
Save money/ minimising cost	4%
Can't fight against the nature/ erosion is inevitable	3%
Cost of living	1%
Should focus on other priorities (e.g. housing, roads)	1%

Base: N = 85

Q8. Which one of these is your preferred outcome?
Q9. Why do you say that?



Questionnaire

Appendix 2

Mid Coast Council
Coastal Management Community Survey
2024

Instructions	
(SR)	Single Response
(MR)	Multiple Responses
(TEXT)	Textbox
(DROP)	Dropdown
(SCALE)	Scale
(SCALE MR)	3D Matrix
(RAND)	Randomise
(ROT)	Rotate
(FLIP)	Flip

Instructions	
Position	Order
Value	Rating
[directions]	Logic

Methodology	
Telephone	30 hours of interviewing
Online	All respondents not completed by telephone after the 30 hours

In the past you completed a community satisfaction survey with Micromex Research for MidCoast Council. Council is seeking to obtain resident feedback about a range of coastal management options that are being considered for Old Bar, Manning Point and elsewhere along the coast. Could I go through that quickly with you now?

Q1. How frequently do you visit coastal locations across the LGA to undertake the following: (SCALE)

Value	Answers	Notes
1	Daily	
2	Every few days	
3	Weekly	
4	Fortnightly	
5	Monthly	
6	Less often	

Position	Answers	Notes
1	Beach or lagoon swimming	
2	Surfing, paddleboarding or kayaking	
3	Walking or running	
4	Dog walking	
5	Cycling	
6	Fishing	
7	Boating	
8	Bird watching	
9	Four-wheel driving	
10	Picnicking	
11	Camping	
12	Other	Specify

Background to current coast management strategy

Q2. When it comes to coastal management, on a scale of 1-5 where 1 is not at all important and 5 is very important, how important are the following considerations? *Prompt* (RAND)

Value	Answers	Notes
5	5 – Very important	
4	4	
3	3	
2	2	
1	1 – Not at all important	

Position	Answers	Notes
1	Protecting the coast's natural processes and ecosystems	
2	Maintaining public access and use	
3	Acknowledging Aboriginal peoples' cultural, social and economic use of the area	
4	Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	
5	Supporting community participation and education around coastal management	
6	Acquiring land to protect, enhance and restore the coastal zone	

Q3. Thinking about the same considerations on a scale of 1-5 where 1 is not at all concerned and 5 is very concerned how concerned are you with the following? *Prompt* (RAND)

Value	Answers	Notes
5	5 – Very concerned	
4	4	
3	3	
2	2	
1	1 – Not at all concerned	

Position	Answers	Notes
1	Protecting the coast's natural processes and ecosystems	
2	Maintaining public access and use	
3	Acknowledging Aboriginal peoples' cultural, social and economic use of the area	
4	Protecting coastal assets and property from the impacts of climate change, sea-level rise and storm events	
5	Supporting community participation and education around coastal management	
6	Acquiring land to protect, enhance and restore the coastal zone	

Concept Statement

Coastal Erosion Hazard mapping for the area suggests that the coastline will be significantly affected by coastal erosion with a number of properties in Old Bar and Manning Point impacted between now and 2100.

There is a range of different management options that are available to Council.

This survey will seek to measure community support for these management options.

Take no action

***Managed retreat* which accepts the inevitable loss of properties, assets and infrastructure and responding to changes when certain things happen such as the loss or damage of a building, road or sewer network.**

***Short- term options* like dune stabilisation, beach nourishment* or the use of very large, sand-filled bags. These actions may slow down the erosion but properties, assets and infrastructure will still be lost.**

***Longer-term options* against coastal erosion by constructing hard engineering structures such as revetment walls, sea walls, groynes** and artificial reefs.**

This survey will seek to measure community support for these management options.

NOTES FOR INTERVEWER:
*beach nourishment is the mechanical movement of sand from one part of the beach (or offshore) to another part. This is commonly done by excavators and trucks or pipelines.

**Groynes are structures built perpendicular to the shoreline and extend into the water. They are designed to trap sand on one side of the groyne but inevitably leads to erosion on the lee side of the structure. Revetment walls are generally constructed as banks from large rocks or boulders. Seawalls are generally more formalised structures constructed in concrete.

Take no action

The advantages of this management option are:

- **Status quo**
- **No upfront cost**
- **Coastal environment/qualities remain intact**

The disadvantages of this management option are:

- **Leads to reactive interventions**
- **Critical infrastructure will be damaged or lost**
- **Unpredictable consequences**
- **May impact wider community (i.e. failed infrastructure)**
- **Reputational damage**

Q4. How supportive are you of this management option? *Prompt* (SR)

Value	Answers	Notes
5	Very supportive	
4	Supportive	
3	Somewhat supportive	
2	Not very supportive	
1	Not at all supportive	

Managed retreat

Managed retreat is the acceptance of the loss of properties, assets and infrastructure but it is planned to minimise the impact of this on the community. Losses and damage are anticipated, and triggers, thresholds or other mechanisms are used to initiate an action.
NOTE FOR INTERVIEWER: An example of this would be when a building is damaged by an erosion event and it is deemed structurally unsound, that dwelling would be demolished. Similarly, if the reticulated sewer network servicing a property is irreparable damaged, the dwelling would be demolished.

The advantages of this management option are:

- **Loss of properties, assets and infrastructure are anticipated and planned for**
- **Contingencies are put in in place to address damage or loss**
- **Community anticipate impact and are better prepared**
- **Roles and responsibilities are stated and understood**
- **Coastal environment/qualities remain intact**

The disadvantages of this management option are:

- **Property, assets, and infrastructure are lost**
- **Highly political at the point of impact**
- **Does not guarantee that reactive interventions won't occur**

Q5. How supportive are you of this management option? *Prompt* (SR)

Value	Answers	Notes
5	Very supportive	
4	Supportive	
3	Somewhat supportive	
2	Not very supportive	
1	Not at all supportive	

Short-term solutions

Short-term solutions like dune stabilisation, creating sand buffers, beach nourishment and large, sand filled bags may help protect against small to medium erosion events but are unlikely to provide any enduring protection against large events. Properties, assets and infrastructure wil still be damaged and lost.

The advantages of this management option are:

- **Relatively low-impact interventions without enduring changes to the coastal environment.**
- **Relatively low cost when compared to hard engineering options.**
- **Extends use and occupation of properties.**
- **Provides additional time to adapt.**

The disadvantages of this management option are:

- **Moderate expense.**
- **Ongoing maintenance costs.**
- **Changes to the coastal environment**
- **May result in changes to amenity and access**
- **Unintended consequences of actions.**

Q6. How supportive are you of this management option? Prompt (SR)

Value	Answers	Notes
5	Very supportive	
4	Supportive	
3	Somewhat supportive	
2	Not very supportive	
1	Not at all supportive	

Longer-term options

Longer-term options against coastal erosion via the construction of hard engineering structures such as revetment walls, sea walls, groynes and artificial reefs.
NOTE FOR INTERVIEWER: Longer-term options have design lives of around 60 years. They require ongoing maintenance and often require other ongoing measures such as beach nourishment to restore sand to the beach.

The advantages of this management option are:

- **Most enduring defence against coastal processes**

The disadvantages of this management option are:

- **High expense**
- **Ongoing maintenance costs**
- **Changes to the coastal environment**
- **Loss of amenity and access (e.g. loss of beach)**
- **Unintended consequences of actions**
- **Locks in an adaption pathway**
- **Intergenerational burden to maintain or remove intervention**

Q7. How supportive are you of this management option? *Prompt* (SR)

Value	Answers	Notes
5	Very supportive	
4	Supportive	
3	Somewhat supportive	
2	Not very supportive	
1	Not at all supportive	

Q8. Which one of these is your preferred outcome? *Prompt* (SR)

Position	Answers	Notes
1	Take no action	
2	Managed retreat	
3	Short-term solutions	
4	Longer term option	

Q9. Why do you say that? (TEXT)

Position	Answers	Notes
1		5 Lines

Q10a. Which of the following should be responsible for paying for the management options? (RAND) (MR)

Position	Answers	Notes
1	State Government	
2	Local Government via rates and levies	
3	Beach users	
4	Affected residents and landowners	
5	Other	

Q10b. Other (Please specify). (TEXT)

Position	Answers	Notes
1		5 lines

Demographic & Profiling Questions

D1. Please stop me when I read out your age group: *Prompt* (SR)

Position	Answers	Notes
1	18 – 34	
2	35 – 49	
3	50 – 64	
4	65 years and over	

D2. Which of the following best describes the dwelling where you are currently living? *Prompt* (SR)

Position	Answers	Notes
1	I/We own/are currently buying this property	
2	I/We currently rent this property	

D3. How long have you lived in the MidCoast Council area? *Prompt* (SR)

Position	Answers	Notes
1	Less than 2 years	
2	2 – 5 years	
3	6 – 10 years	
4	11 – 20 years	
5	More than 20 years	

D4. Gender (determine by voice): (SR)

Position	Answers	Notes
1	Male	
2	Female	

The information contained herein is believed to be reliable and accurate, however, no guarantee is given as to its accuracy and reliability, and no responsibility or liability for any information, opinions or commentary contained herein, or for any consequences of its use, will be accepted by Micromex Research, or by any person involved in the preparation of this report.

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Appendix D Filtering of Previously Identified Management Options

ID	Source		Management option	Classification	Report section
1	Old Bar Beach Scraping Feasability Discussion	2017 State Government	Beach scraping	Old Bar	3.6.8
2	Manning Point Beach Nourishment	2019 MCC	Beach Nourishment - Trucking	Manning Point	3.8.3
3	Coastal Erosion: An "Elegantly Simple Solution" at Harrington	2023 Grant Calvin	Relocation of the gantry has been considered in Manning River Southern Breakwall Feasibility Study	Infeasible	
4	Manning River southern breakwater feasibility study	2018 State Government	Enhancement of alternative port	Infeasible	
5	Manning River southern breakwater feasibility study	2018 State Government	Routine dredging scheme	Infeasible	
6	Manning River southern breakwater feasibility study	2018 State Government	Creating a tomolo or protected sand spit	Infeasible	
7	Manning River southern breakwater feasibility study	2018 State Government	Stablising the Manning Point sand spit	Infeasible	
8	Manning River southern breakwater feasibility study	2018 State Government	Relocation of gantry	Repeat of 3	
9	Report of the Manning River Taskforce	2020 State Government	Routine dredging scheme	Repeat of 5	
10	Report of the Manning River Taskforce	2020 State Government	Southern entrance breakwater option	Infeasible	
11	Report of the Manning River Taskforce	2020 State Government	Manning Point Entrance	Infeasible	
12	Cost-benefit analysis of options to protect Old Bar from Coastal Erosion	2014 Balmoral Group	Do nothing	Old Bar	3.6.1
13	Cost-benefit analysis of options to protect Old Bar from Coastal Erosion	2014 Balmoral Group	Stage 1 Revetment Wall (Lewis Street)	Old Bar	3.6.2
14	Cost-benefit analysis of options to protect Old Bar from Coastal Erosion	2014 Balmoral Group	Stage 1 combined with Stage 2 Revetment Wall (Pacific Parade) Planned retreat	Old Bar	3.6.3
15	A review of artifical reefs for coastal protection in NSW	2013 UNSW - Water Research Laboratory	Submerged breakwater structures	Old Bar	3.6.4
16	A review of artifical reefs for coastal protection in NSW	2013 UNSW - Water Research Laboratory	Multipurpose reef	Old Bar	3.6.4
17	Manning River Floodplain Risk Management Study and Plan.	2020 BMT	Farqhuar training walls	Infeasible	
19	Old Bar Coastal Protection Structure Design Investigation	2013 Royal HaskoningDHV	Stage 1 Revetment Wall (Lewis Street)	Repeat of 13	
20	Old Bar Coastal Protection Structure Design Investigation	2013 Royal HaskoningDHV	Beach nourishment	Infeasible	
21	Old Bar Coastal Protection Structure Design Investigation	2013 Royal HaskoningDHV	Groynes and Groynes fields	Infeasible	
22	Old Bar Coastal Protection Structure Design Investigation	2013 Royal HaskoningDHV	Offshore Reef and eneach nourishment.	Repeat of 16	
25	Coastal Management Study	2010 Worley Parsons	Property purchase	Old Bar	3.6.7
26	Coastal Management Study	2010 Worley Parsons	Revetment (with and without beach nourishment)	Repeat of 13/14	
27	Coastal Management Study	2010 Worley Parsons	Revetment (with nourishment)	Infeasible	
28	Coastal Management Study	2010 Worley Parsons	Massive beach nourishment	Infeasible	
29	Coastal Management Study	2010 Worley Parsons	Farqhuar Inlet entrance structure and beach nourishment	Infeasible	
30	Coastal Management Study	2010 Worley Parsons	Groyne field and beach nourishment	Infeasible	
31	Coastal Management Study	2010 Worley Parsons	Offshore reef and beach nourishment	Infeasible	
33	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Existing flood notch protocol	No regrets	3.2.2
35	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Flood notch with reduced elevation	No regrets	3.2.2
36	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Decision-making framework for flood notch and pilot channel	No regrets	3.2.2
37	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Dredging to keep a centrace entrance open continuously	Farquhar	3.7.2
38	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Dredging to form a lake behind the closed beach berm	Farquhar	3.7.4
39	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Dredging to form an entrance at the southern limit of Farquhar Inlet	Farquhar	3.7.3
40	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Dredging to form an entrance at the southern limit of Farquhar Inlet with geofabric container training wall and breakwater	Farquhar	3.7.3
41	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Dredging to form an entrance at the southern limit of Farquhar Inlet with geofabric container and rock training walls and breakwaters	Repeat of 40	
42	Farquar Inlet - Entrance Opening Management Plan	2010 Worley Parsons	Permanent entrance incorporating rock training walls and breakwaters	Repeat of 37	
43	Internal discussion paper	MCC 2024	Relocate essential services as necessary (water services, energy supply, Telstra cable etc.)	Wallabi Pt, No regrets	
44	Internal discussion paper	MCC 2024	Prepare reuse strategy for the area with a focus against resilience to coastal processes	Wallabi Pt, No regrets	3.5.3
45	Internal discussion paper	MCC 2024	Revetment wall (Lewis Street) Beach nourishment and maintenance.	Repeat of 13	
46	Internal discussion paper	MCC 2024	Revetment wall (Pacific Parade) Beach nourishment and maintenance.	Repeat of 14	
47	Internal discussion paper	MCC 2024	Artificial reef, ongoing maintenance and shoreline management	Repeat of 16	
48	Internal discussion paper	MCC 2024	Groyne, beach nourishment and maintenance.	Infeasible (Repeat of 28)	

ID	Source		Management option	Classification	Report section
49	Internal discussion paper	MCC 2024	Beach nourishment (including beach scraping).	Repeat of 28	
50	Internal discussion paper	MCC 2024	Sand filled geotextile bags (Lewis Street and Pacific Parade)	Old Bar	3.6.5
51	Internal discussion paper	MCC 2024	Rock Filled Bags (Lewis Street and Pacific Parade)	Old Bar	3.6.6
52	Internal discussion paper	MCC 2024	Adaptation policy and guidelines to manage hazards over time in a sustainable manner.	No regrets	3.2.1
53	Internal discussion paper	MCC 2024	Groyne and Maintenance	Infeasible (Repeat of 28)	
54	Internal discussion paper	MCC 2024	Beach nourishment (including sand scraping).	Repeat	
55	Internal discussion paper	MCC 2024	Develop policy approach to sustainable future management of the beach.	Repeat of 52	
56	Internal discussion paper	MCC 2024	Install training walls on inlet.	Repeat of 37	
57	Internal discussion paper	MCC 2024	Review existing entrance opening strategy.	Repeat of 33	
58	Internal discussion paper	MCC 2024	4.3 Review current dredging strategy for the Manning River	Repeat of 33	
59	Internal discussion paper	MCC 2024	Include inlet opening trigger in the emergency Plan to address flooding.	No regrets	3.2.2
60	Internal discussion paper	MCC 2024	Manage the foreshores with soft options including revegetation and dune works.	Mitchells Island	3.8.2
61	Internal discussion paper	MCC 2024	Prepare planning guidelines to identify high risk areas and adapt planning controls to minimise risk to existing development as the flood and recession hazards increase in future.	No regrets	3.2.1
62	Internal discussion paper	MCC 2024	Develop planning framework to address future increase in hazards and prolong sustainable usage of the area.	No regrets	3.2.1
63	Internal discussion paper	MCC 2024	Implement soft management works (beach scraping, beach nourishment, dune management) to address shoreline change and minimise risk of the spit breaking through.	Repeat of 2	
63	Internal discussion paper	MCC 2024	Community education and awareness	No regrets	3.2.3
64	Internal discussion paper	MCC 2024	Amendments to RH SEPP, LEP and DCP	No regrets	3.2.4
65	Internal discussion paper	MCC 2024	Aboriginal cultural heritage assessment and adaptation study	No regrets	3.3.5
66	Internal discussion paper	MCC 2024	Community facilities and public spaces asset management plan	No regrets	3.3.6
67	Internal discussion paper	MCC 2024	Transport asset management plan	No regrets	3.3.7
68	Internal discussion paper	MCC 2024	Water and sewer infrastructure asset management plan	No regrets	3.3.8
69	Internal discussion paper	MCC 2024	coastal wetlands and littoral rainforests	No regrets	3.3.9
70	Internal discussion paper	MCC 2024	4WD beach access and user management	No regrets	3.3.10
71	Internal discussion paper	MCC 2024	Manage important shoreline bird sites	No regrets	3.3.11

Appendix E Consideration of Infeasible Actions

ID	Source		Management option	Reason for Infeasibility
3/8	Coastal Erosion: An "Elegantly Simple Solution" at Harrington	2023 Grant Calvin	Relocation of gantry	Considered most likely ineffective by 2018 State Government Report, and eliminated from consideration in Strategic Business Case for Harrington Entrance. Only considered a "secondary option" as it is unlikely to impact on stability of entrance. (State Government, 2020)
4	Manning River southern breakwater feasibility study	2018 State Government	Enhancement of alternative port	Options outside study area.
5/9	Manning River southern breakwater feasibility study	20180 State Government	Routine dredging scheme	Ultimately eliminated from Manning Entrance Strategic Business Case, in favour of fixed sand pumping infrastructure.
6	Manning River southern breakwater feasibility study	2018 State Government	Creating a tombolo or protected sand spit	Option not shortlisted by State Government, 2020.
7	Manning River southern breakwater feasibility study	2018 State Government	Stabilising the Manning Point sand spit	Option not shortlisted by State Government, 2020.
10	Report of the Manning River Taskforce	2020 State Government	Southern entrance breakwater option	Carried forward to Manning Entrance SBC, but ultimately not recommended.
11	Report of the Manning River Taskforce	2020 State Government	Manning Point Entrance	Carried forward to Manning Entrance SBC, but ultimately not recommended.
17/42/56	Manning River Floodplain Risk Management Study and Plan.	2020 BMT	Farqhuar training walls	Too costly ($75M)
20/28/49	Old Bar Coastal Protection Structure Design Investigation	2013 Royal HaskoningDHV	Beach nourishment	Too costly ($150M)
21/30/48/53	Old Bar Coastal Protection Structure Design Investigation	2013 Royal HaskoningDHV	Groynes and Groynes fields	Assessed as being ineffective at this site by Royal Haskoning
27	Coastal Management Study	2010 Worley Parsons	Revetment (with nourishment)	Too costly ($40M)
29	Coastal Management Study	2010 Worley Parsons	Farqhuar Inlet entrance structure and beach nourishment	Too costly ($80M)
31/22/47	Coastal Management Study	2010 Worley Parsons	Offshore reef and beach nourishment	Too costly ($50M)