Wavelength

1 August 2022

Coastal Adaptation Plan

Prepared for

ALEXANDRINA

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Executive summary

In 2021, Council adopted a Coastal Adaptation Study (CAS) to identify assets (built and natural) that are at risk and potential adaptation options for the coastline. The CAS provided a baseline assessment of:

- The level of inherent risk from both coastal erosion and inundation
- The assets at risk now (2020) and in the future (2100)
- A preliminary assessment of viable adaptation pathways (e.g. retreat, protect, accommodate)

The CAS categorised most of the coastline as low or medium risk for future erosion and/or inundation, except for the Murray Estuary Settlements (Mundoo and Goolwa Channels), and Horseshoe Bay (Port Elliot). These areas were assessed as a higher risk to erosion and inundation.

To support and build on the CAS, Wavelength, in partnership with UPRS, were engaged to develop a Coastal Adaptation Plan (CAP) for the Alexandrina coast. The primary objective of the CAP is to provide a roadmap for Council, identifying priority works for the immediate, intermediate, and longer term.

The process undertaken to develop the CAP involved the following key tasks:

- **Review of all CAS documents** including the community engagement that was undertaken as part of the study.
- A **review of coastal adaptation works** which have been undertaken by Council since the CAS was released in 2020.
- An overarching coastal **monitoring plan** (presented in Section 2) outlining the required monitoring actions, data to be collected, extent and frequencies.
- An **engagement plan (**summarised in Section 5 and full plan in Appendix A) was prepared that considers each coastal management cell separately, whilst seeking opportunities for overarching principles and approaches.
- A **gap analysis** (presented in Section 4) was developed to identify any additional data and or activities (e.g. further analysis or engagement) requirements to support the CAP. The identified gaps have been scoped with an indication of required resources, timing, costs, triggers for actioning and the risk to the CAP if they are not filled.
- **Adaptation plans** for each cell have been prepared (summarised in Section 5 and full detail in Appendix B), outlining any immediate actions and future analysis to support the adaptation pathway for each coastal management cell.

This CAP is intended to be read as a supporting document to the Adaptation Implementation Plans (Implementation Plans) provided to Council. The Implementation Plans are the primary deliverable for this CAP. The Implementation Plans are intended to be a living document, a centralised portal for all coastal adaptation planning initiatives.

The Implementation Plans will assist Council in tracking the progress of each initiative in terms of project status, scheduling and responsibilities. Clear triggers for future tasks are clearly identified.

Monitoring Plan

The **primary objectives** of the monitoring plan are to provide:

1. Greater insight into seasonal, interannual and inter decadal patterns. This is of particular importance for Council's coastline given that sections of the coastline are currently accreting (growing). It will be important to identify when/if this pattern changes and beaches begin to recede.
2. The evidence for triggering future actions outlined in this plan.

A tiered approach to monitoring is recommended:

1. **Short term qualitative coastal monitoring** via photo monitoring biannually (March, October) and post storm events.

2. **Long term quantitative coastal monitoring** via:
    a. Review of SLR projections
    b. Condition assessment of seawalls (Horseshoe Bay)
    c. Aerial photo and cross shore profile review and comparison to baseline assessment
    d. LiDAR capture and comparison to baseline assessment
    e. 3-D modelling of cliffed sections of coastline (Middleton)

Engagement Plan

An Engagement Plan has been prepared to provide a recommended approach for the delivery of the identified engagement tasks. The Engagement Plan provides direction in two parts:

1. **Guidance for project-wide engagement**

The Engagement Plan provides guidance on how to undertake engagement for coastal adaptation across the whole project. It includes a stakeholder assessment to identify the types of people, groups and organisations with an interest or that are impacted by coastal adaptation and what their engagement needs are. It includes guidance for engagement actions to promote the coastal adaptation investment and efforts of Council to build reputation and trust with community.

2. **Short term location specific engagement actions**

The Engagement Plan provides guidance for implementation of engagement tasks that the CAP indicates as needing to commence "now" for specific locations. It includes engagement objectives, key messages and activities to guide engagement for:

- **Mundoo Channel and Goolwa Channel** - communication of flood risk to community and stakeholders, discussion of adaptation options and development of Flood Emergency Plans
- **Horseshoe Bay** – communication of coastal erosion risk Council building lessees and stakeholders and preparation of a Master Plan with community and stakeholders.
- **Boomer-Knight Beach** – communication of coastal erosion risk to trainline to relevant stakeholders.

Gap Analysis

The gap analysis identified several knowledge gaps. Given the stable nature of most of the Council's coastline the impact of these gaps on achieving the objectives of the CAP are generally low. To limit the longer-term impact to Council's coastal adaptation planning, triggers have been outlined to confirm when and how these knowledge gaps would need to be filled. The most common knowledge gaps identified include:

- The consideration of midterm erosion risk (timeframes between present day and 2100, typically 2050)
- The consideration of risk to private properties
- The assessment of longer-term adaptation options
- Consideration for all viable adaptation options (appropriate for the medium and longer term), more specifically testing the merits and constraints of each adaptation option type against each other in line with best practice.

Summary of priority actions

Below provides a summary of Council's priority actions identified in the CAP:

- Establish coastal monitoring program
- Engage with the Planning and Land Use Services (PLUS) review process
- Communicate risk to Crown and Railway Society regarding trainline, Boomer Beach
- Planning and engagement activities regarding current and future flood risk, Mundoo and Goolwa Channel (including Beacon 19)
- Data collection and modelling study, Horseshoe Bay (Port Elliot)
- Initial consultation with asset owners regarding the master planning process, Horseshoe Bay (Port Elliot)

Client	Alexandrina Council
Document title	Coastal Adaptation Plan
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Rev	Date	Description	Prepared	Reviewed/To
A	29/06/2022	Draft for internal review	A Sandery	J Bailey
B	04/07/2022	Draft for client issue	A Sandery	Alexandrina Council
0	01/08/2022	Final report issued	A Sandery	Alexandrina Council

Contents

Glossary

AHD	Australian Height Datum
BoM	Bureau of Meteorology
CAP	Coastal Adaptation Plan
CAP	Coastal Adaptation Strategy
CBA	Cost-Benefit Analysis
CD	Chart Datum
CPB	Coast Protection Board
DEW	Department of Environment and Water
DIT	Department of Infrastructure and Transport
DEM	Digital Elevation Model
HSD	Horizontal Setback Datum
IPCC	Intergovernmental Panel for Climate Change
LGA	Local Government Association of South Australia
MCA	Multi Criteria Assessment
SLR	Sea Level Rise

1 Introduction and background

Alexandrina Council (Council) manages a coastline that is treasured by residents and visitors for its amenity, recreation opportunities and environmental and cultural values. Careful and considered planning is required to ensure the coast is managed appropriately and adaptation options are developed and implemented to manage the future impacts of climate change. The full extent of the coastline under Council's jurisdiction is shown in Figure 1.

In 2020, Council completed a Coastal Adaptation Study (CAS) to identify assets (built and natural) that are at risk and potential adaptation options for the coastline. The CAS provided a baseline assessment of:

- The level of inherent risk from both coastal erosion and inundation
- The assets at risk now (2020) and in the future (2100)
- A preliminary assessment of viable adaptation pathways (e.g. retreat, protect, accommodate)

The CAS categorised most of the coastline as low or medium risk for future erosion and/or inundation, except for the Murray Estuary Settlements (Mundoo and Goolwa Channels), and Horseshoe Bay (Port Elliot). These areas were assessed as a higher risk to erosion and inundation.

Figure 1: Alexandrina Council coastline

To support and build on the CAS, Wavelength, in partnership with UPRS, were engaged to develop a Coastal Adaptation Plan (CAP) for the Alexandrina coast. The primary objective of the CAP is to provide a roadmap for Council, identifying priority works for the immediate, intermediate, and longer term. More specifically, the CAP must:

- Identify priority works.
- Set out the required monitoring regimes with clear triggers for actioning future works.
- Break down recommended works into actionable steps, with guidance on timing, required resources and an indication of costs (low, medium and high in line with cost criteria set out in Table 1).
- Include a supporting engagement strategy, identifying clearly who, when and how engagement will be required.
- Align with other relevant plans and strategies (including Council's Strategic Community Plan; Long-term Financial Plan and Assets Management Plan).
- Align with industry best practice for adaptation planning (including SALGA's SA Coastal Adaptation Guidelines 2020).

1.1. Approach

The process undertaken to develop the CAP involved the following key tasks:

- **Review of all CAS documents** including the community engagement that was undertaken as part of the study.
- A **review of coastal adaptation works** which have been undertaken by Council since the CAS was released in 2020.
- A **gap analysis** was developed to identify any additional data and or activities (e.g. further analysis or engagement) requirements to support the CAP. The identified gaps have been scoped with an indication of required resources, timing, costs, triggers for actioning and the risk to the CAP if they are not filled.
- An overarching coastal **monitoring plan** outlining the required monitoring actions, data to be collected, extent, frequency and method of capture.
- **Adaptation plans** for each cell have been prepared, outlining any immediate actions and future analysis to support the adaptation pathway for each coastal management cell
- An **engagement strategy** was prepared that considers each coastal management cell separately, whilst seeking opportunities for overarching principles and approaches.

This CAP is intended to be read as a supporting document to the Adaptation Implementation Plans (Implementation Plans) provided to Council.

The Implementation Plans are the primary deliverable for this CAP. The Implementation Plans are intended to be a living document, a centralised portal for all coastal adaptation planning initiatives.

The Implementation Plans will assist Council in tracking the progress of each initiative in terms of project status, scheduling and responsibilities. Clear triggers for future tasks are clearly identified.

1.2. Using the Implementation Plans

The CAS included stand-alone reports for the nine coastal conservation cells within Council's coastline as presented in Figure 2. For simplicity, the same coastal management cells (cells) have been adopted for the CAP, however (where appropriate) consolidation of tasks across cells has been undertaken. The cells include:

- Cells 1 – 2: The Murray Estuary settlements including Beacon 19
- Cells 3 – 4: Goolwa Beach
- Cell 5: Middleton Beach
- Cell 6: Middleton Creek
- Cell 7: Ratalang-Basham
- Cell 8: Port Elliot – Horseshoe Bay
- Cell 8.2 – Cell 8.3: Port Elliot – Green Bay and Crockery Bay
- Cell 9: Boomer-Knights Beach

Figure 2: Delegation of coastal management cells

Individual adaptation plans have been developed for each cell, identifying the specific tasks, gaps and triggers associated with each cell. Where appropriate, tasks have been grouped across cells. Priority tasks for the whole coastline have been identified and summarised in Section 6.

The likely cost rating associated with each task has been assigned inline with cost criteria set out in Table 1 below.

Table 1: Cost Criteria

COST	
Low	< $ 20,000
Medium	$20,000 - 100,000
High	$ 100,000 - $250,000

1.3. Limitations

Please note the following key limitations in the development of the CAP:

- This CAP is intended to be a supplementary document to the Implementation Plans.
- A technical peer review of the 2020 CAS documents was not undertaken and the analysis presented in the CAS has been relied upon. No further analysis, inspections, or risk/hazards assessments were undertaken in the development of the CAP.
- Where appropriate, gaps in the CAS process were noted and the risk of these gaps to the overall adaptation planning process was assessed, (refer Section 4).
- Assessment of which organisation is responsible (in terms of delivery and funding) each initiative was not undertaken. It is recommended that Council undertakes an internal audit of responsibilities to provide greater transparency on this issue and to identify where risk/responsibility needs to be communicated to other parties/asset owners.
- The Implementation Plans are intended to be a living document that Council owns and manages on an ongoing basis. Given this, the priority actions outlined in this supplementary report represent a snapshot in time. Priorities are likely to change as influencing factors change (e.g. proposed development, sea level rise, planning priorities). Council will need to review and update the CAP and Implementation Plans accordingly.

2 Monitoring plan

2.1. Objectives

Coastal monitoring is the collection of data (both qualitative and quantitative) to assess changes to a coastline over time against an established baseline. The baseline of Council's coastline was established in the CAS, which has informed this monitoring plan.

Coastal monitoring is imperative to the adaptation planning process. A monitoring plan embedded in Council's operations will provide an opportunity to move away from reactive coastal management. Ongoing long-term monitoring will provide Council with the opportunity to be informed of potential impacts of coastal hazards well in advance of impacts being realised.

The **primary objectives** of the monitoring plan are to provide:

1. Greater insight into seasonal, interannual and inter decadal patterns. This is of particular importance for Council's coastline given that sections of the coastline are currently accreting (growing). It will be important to identify when/if this pattern changes and beaches begin to recede.
2. The evidence for triggering future actions outlined in this plan.

2.2. Overview

This monitoring plan provides a framework for executing the coastal monitoring works. The monitoring plan provides clarity on the methods, frequency, costs and resources required for Council to build into their future works programs and budgets. The plan has been developed to fit Council's specific needs, considering:

- Potential budget constraints, available funds to support the monitoring plan.
- An understanding of best practice and available coastal monitoring techniques, their intended purposes and cost/benefit trade-offs of various approaches.
- The nature of Council's coastline and the variations between coastal management cells.
- An informed understanding of the inherent coastal hazards and level of risk from the baseline assessment provided in the CAS including an understanding of key hot spots.

To determine the required level (accuracy, frequency) and method of monitoring it is important to understand the drivers in each coastal management cell. Table 2 provides a summary of the main coastal drivers in each management cell and the associated monitoring recommendations.

Table 2: Summary of key drivers for coastal monitoring

Coastal Management Cell	Coastal Setting	Current Coastal Hazard Risk	2100 Coastal Hazard Risk	What needs to be monitored?
1-2: Murray Estuary settlements including Beacon 19	• Low lying sand flat within estuaries.	**Erosion:** Low **Flooding:** Low	**Erosion:** High **Flooding:** High	• Sea level rise (SLR) specific to the region • Impacts of storm events upon settlements • Height and nature of dune to the eastern side of Sugars Ave.

3-4: Goolwa Beach and Tokuremoar Reserve	• Dissipative high energy beach facing the Southern Ocean.
	• Remained relatively stable over the past 70 years.
	• Currently in an accretion cycle.
	• Tokuremoar Reserve is situated behind low set dunes on Goolwa Beach.
		Erosion: Low
		
		Flooding: Low
			Erosion: High (risk to Ecosystem disruption)
			
			Flooding: Low
				• Changes to the shoreline overtime, more specifically:
				  ○ Shoreline position
				  ○ Dune volume
				  ○ Breaches of the dunes
				  ○ Buffer fronting SLSC
				• Impacts during storm events

5: Middleton	• Dissipative high energy beach.
	• Backshore varying from low height dunes to soft rock cliffs.
	• Considered to be in an accretion cycle.
		Erosion: Moderate (risk to Public Infrastructure)
		
		Flooding: Low
			Erosion: High (risk to Public Infrastructure and Private Property)
			
			Flooding: Low
				• Changes to the shoreline overtime, more specifically:
				  ○ Shoreline position
				  ○ Dune volume
				• Impacts during storm events
				• Base of the escarpment fronting Chapman St carpark
				• Undercut cliff adjacent to cliffs east of Boetchetter Rd to Miami Bld

6: Middleton Creek	• Middleton Point is underpinned by reef and bordered by sandstone outcrops.
	• CAS indicated some (2 – 4 m) of erosion since 1949 for west of Middleton Point.
	• East of Middleton Point marks the beginning of a long dissipative high energy beach backed by small dune systems, this section is considered in a stable position
		Erosion: Low
		
		Flooding: Low
			Erosion: High (risk to Public Infrastructure and Private Property)
			
			Flooding: Low
				• Changes to the shoreline overtime, more specifically:
				  ○ Shoreline position
				  ○ Dune volume
				• Impacts during storm events
				• The base of the escarpment in front of the carparks
				• The condition of the dunes in front of the walking trail
				• Sand levels at the base of Surf St (stormwater outfall impacts)

7: Ratalang-Basham	• Sandy shore backed by dunes
	• Shoreline is backed by soft sediment rising to elevation of 12-18m at ~500m inland
	• Considered to be stable for the past 70 years
		Erosion: Moderate (risk to ecosystem disruption)
		
		Flooding: moderate (Environment)
			Erosion: Extreme (risk to Ecosystem disruption)
			
			Flooding: Extreme (Environment)
				• Changes to the shoreline overtime, more specifically:
				  ○ Shoreline position
				  ○ Dune volume
				  ○ Breaches of the dunes
				• Impacts during storm events

Coastal Management Cell	Coastal Setting	Current Coastal Hazard Risk	2100 Coastal Hazard Risk	What needs to be monitored?

8: Port Elliot – Horseshoe Bay	• Reflective coarse sand beach bordered by granite headlands.
	• The shoreline is backed by seawalls on western end, embankment in the centre, and dunes on eastern end.
	• CAS outlined a significant change to the nature of the beach over the past 100 years.
		Erosion: Moderate (risk to Public Infrastructure)
		
		Flooding: Low
			Erosion: Extreme (risk to Public Infrastructure)
			
			Flooding: Low
				• Changes to the shoreline overtime, more specifically:
				  ○ Shoreline position
				  ○ Dune volume
				• Impacts during storm events
				• Condition of seawall structures in western section
				• Normal range of the beach (erosion – accretion cycle)

8.1: Port Elliot – Green Bay	• Rocky beach, underpinned by reef, and bordered by granite headlands. • Historical analysis indicates that the back-shore of the beach has not, and is currently not being impacted by actions of the sea.	**Erosion:** Low **Flooding:** Low	**Erosion:** Extreme (risk to Public Infrastructure) **Flooding:** Low	• Impacts during storm events
8.2: Port Elliot - Crockery Bay	• Rocky pocket beach, underpinned by reef and bordered by granite outcrops. • CAS indicated that the back-shore of the beach has not, and is currently not being impacted by actions of the sea.	**Erosion:** Low **Flooding:** Low	**Erosion:** Low **Flooding:** Low	• Impacts during storm events

9: Knights Beach	• A reflective sandy beach, bordered by granite headlands on the east.
	• CAS suggested that the beach had not and is not currently being impacted by actions of the sea.
		Erosion: Low
		
		Flooding: Low
			Erosion: High (risk to Public Infrastructure and Private Assets)
			
			Flooding: Low
				• Changes to the shoreline over time, more specifically:
				  ○ Shoreline position
				  ○ Cliff erosion
				• Impacts during storm events

9: Boomers Beach	• Reflective medium sandy beach.
	• CAS suggests that the backshore of the beach undergoes periodic accretion and recession over a period of decades. Currently the beach has been accreting for approx. 10years
		Erosion: Low
		
		Flooding: Low
			Erosion: Extreme (risk to Public Infrastructure and Private Assets)
			
			Flooding: Low
				• Changes to the shoreline overtime, more specifically:
				  ○ Shoreline position
				  ○ Dune volume
				• Impacts during storm events
				• Normal range of the beach (erosion – accretion cycle)

2.3. Approach

For simplicity, a monitoring plan has been developed for the entire Coastline, rather than for each management cell. This approach allows for cost savings without compromising on the outcomes of the monitoring.

A tiered approach to monitoring is recommended:

3. **Short term qualitative coastal monitoring** via photo monitoring biannually (March, October) and post storm events.

4. **Long term quantitative coastal monitoring** via:
    a. Review of SLR projections
    b. Condition assessment of seawalls (Horseshoe Bay)
    c. Aerial photo and cross shore profile review and comparison to baseline assessment
    d. LiDAR capture and comparison to baseline assessment
    e. 3-D modelling of cliffed sections of coastline (Middleton)

The two-monitoring approaches are described in more detail below and summarised in Table 3.

Table 3: Overview of coastal monitoring plan

Monitoring approach	Task Name	Coastal Management Cell	Timing	Responsibility	Indicative Cost ($)
Short term qualitative coastal monitoring	**Photo monitoring**	All	Biannually (March, October) and post storm events	To be confirmed by Council	Low
Long term quantitative coastal monitoring	**Review SLR projections**	All	2025 (repeat every 5 years)	**Lead:** Council **Support:** CPB/DEW	NA
	Cross shore profile and aerial photo review	All (except Cell 1 & 2 - Mundoo Murrary)		**Lead:** Qualified coastal engineer **Support:** DEW CMB	Low
	LiDAR capture and review	All	2028 (Repeat every 10 years)	**Lead:** Qualified coastal engineer	Medium
	Seawall condition assessment	Cell 8 – Horseshoe Bay	2025 (repeat every 5 years)	**Lead:** Qualified coastal engineer	Low
	3D modelling of cliff sections	Cell 5 - Middleton	Capture Baseline, 2023 (Repeat every 5 years)	**Lead:** Qualified coastal engineer	Low

2.4. Short term qualitative monitoring

Responsibility: TBD **Cost:** Low **Timing:** Biannually (March, October) and post storm events

Qualitative monitoring through photo capture provides a cost-effective way to assess changes that occur to the shoreline, seasonally, interannually and post significant storm events. It can also provide a way to involve the community, connecting the broader community to the adaption planning process.

There are two models that Council could adopt:

1. **Through a citizen science project**. Where by, the initial program may need to be set up by Council and community leaders however longer term, the photos are captured by the community and uploaded to an App (such as CoastSnap, Fluker Posts, Photomon). These programs then manage the storage of photos and can provide the comparison between photos (i.e. changes to the coastline) over time.
   Benefits: cost effective and a great way engage the community.
   Constraints: likely to require oversight and involvement from Council and without focus the photos collected may provide the required monitoring information

2. **By Council**. Routine photo monitoring at identified locations and post significant storm events.
   Benefits: Council officers are likely to be undertaking on ground works along the coastline particularly post storm events. With one representative from Council championing the collection, storage and comparison of photos, providing greater quality control measures for the data.
   Constraints: management and storage of photos and undertaking comparison can be time consuming for Council staff.

Council will need to consider the benefits and constraints of both models and with support from a coastal specialist, confirm:

- Model of monitoring to be adopted (citizen science /Council owned)
- Objectives, methodology and confirm maker locations
- Ownership, who is ultimately responsible for the success of the monitoring program
- Document process in a standalone information sheet
- Undertake briefing session with community leaders and Council staff

Figure 3: Moffat Beach, CoastSnap location (Sunshine Coast News, Dec 2021)

2.5. Longer term quantitative monitoring

2.5.1. Review of SLR projections

Responsibility: Council **Cost:** Low **Timing:** 2025 (repeat every five years)

The projected risk to Council's coastline will be largely influenced by sea level rise meeting and or exceeding current projections. DEW undertake review of IPPC released data and undertake ongoing monitoring of local tide gauges to confirm the appropriateness of State policy documents such as the Coastal Protection Board Policy Document (Coast Protection Board, 2004). It would be prudent to confirm with DEW, every five years if projected sea level rise is still in line with projection assumed in the 2020 CAS.

If sea levels rise projections are increased from that presented in the CAS, this would trigger a review of this CAP to identify areas likely to be impacted and what adaptation actions may need to be brought forward.

2.5.2. Cross shore profiles and aerial review

Responsibility: Qualified coastal engineer **Cost:** Low **Timing:** 2025 (repeat every five years)

DEW CMB undertake coastal monitoring across the state via the survey of cross shore profiles at designated locations. These cross-shore profiles have been captured for over 40 years in some areas providing a great overview of how the coastline has changed over time. Table 4 below presents the profile IDs and locations specific to Council's coastline. The frequency of the capture of these cross-shore profiles can vary by location and is largely driven by the severity of coastal risks at that location or triggered by an event.

Comparison of historical aerial photos is a common analysis technique for assessing the changes of a beach shoreline over time. The most common approach is to map both the high-water mark and observed vegetation line.

A qualified coastal engineer would undertake the following tasks:

- Obtain all relevant cross shore profiles (listed in Table 4) captured since 2020
- Obtain a recent aerial photo at high resolution and overlay on (1949, 2016) and map the changed in Mean High Water (if possible) and vegetation line
- Review data and provide summary of shoreline changes for each management cell

Based on the review undertaken the coastal engineer should identify and provide recommendations relating to the following questions:

- Are there any changes required to this monitoring plan (i.e. frequencies and methods)?
- Have any triggers been reached (as set out in this CAP)?
- Are there any required changes to this CAP (i.e. timing, required actions)?

Table 4: DEW Cross Shore profiles

Profile Location	Profile ID
Cell 3: Goolwa Beach	615009, 615011
Cell 4: Tokuremoar Reserve	615005
Cell 5: Middleton Beach	615006
Cell 6: Middleton Creek	615004 and 615007
Cell 7: Ratalang Basham	615003
Cell 8: Horseshoe Bay	615002
Cell 9: Boomers Beach	615001

2.5.3. Seawall condition assessment (Horseshoe Bay)

The CAS notes that the jetty rock revetment and the stone wall on the western end of Horseshoe Bay, are largely effective at performing their function (whilst in varying condition).

The CAS identified cracking of the stone wall fronting the café and some stability concerns for the section of wall under the board walk, as shown in Figure 4. Given the age of these protection structures (jetty rock revetment built in the 1950s and stone wall built in the 1930s with minor repairs in 1980s), and the value of the assets they are protecting it would be prudent (and in line with best practice) to ensure a condition assessment is undertaken by a qualified coastal engineer every five years.

For the stone wall, the assessment must include:

- Crest condition (tie in with promenade / overtopping / potholing)
- Slumping (evidence of undercutting)
- Rotation (evidence of undercutting or excessive loads)
- Cracks (evidence of excessive loads or loss of backfill material)

For the rock revetment, the assessment must include:

- Breach / loss of crest elevation and core exposure
- Armour movement / loss , interlocking (or lack thereof)
- Armour quality / presence of defects
- Slope defects / local failures

Figure 4: Stone wall fronting café cracking and rotated (left), Stone wall below board walk in poor condition (right). (Western et al., 2019g)

2.5.4. LiDAR capture and review

Responsibility: Coastal engineer **Cost:** Low **Timing:** 2028 (repeat every ten years)

The CAS provided a baseline assessment using the 2018 Digital Evaluation Model (DEM) for the coastline. The baseline assessment identified that most of the coastline (within the exception of Horseshoe Bay) is relatively stable. Given this, a 10-year interval will suffice given that hotspot monitoring will be undertaken through photo monitoring and review of cross shore profiles and aerial photos will provide interim assessments of shoreline movements.

The DEM would likely be captured via commercial contract for the length Council's coastline and the analysis of change between data sets (2028 – 2018) to be undertaken by a coastal specialist. For each management cell, the review should consider any significant changes to the shoreline, dune volumes and identify areas where dunes have been breached.

Based on the review undertaken, the coastal specialist should identify and provide recommendations relating to the following questions:

- Are there any changes required to this monitoring plan (i.e. frequencies and methods)?
- Have any triggers been reached (as set out in this CAP)?
- Are there any required changes to this CAP (i.e. timing, required actions)?

2.5.5. Modelling of cliff sections of coastline (Middleton)

Responsibility: Commercial contract **Cost:** Low **Timing:** 2023 (repeat every five years)

For the cliffed section of coastline at Middleton Beach, more specifically east of Boetchetter Rd to Miami Bld. Given the vertical nature of these cliffs and undercutting in places, these sections will not be adequality captured using LiDAR capture. A 3D digital model of this section of coastline is recommended in order to adequately monitor the rate in which these cliffs are receding over time.

A commercial contractor would need to be engaged to capture a 3D Aerial Survey of the cliffed section of coastline. A preliminary quote from a commercial contractor indicates that this would be a five-week program at approx. $10K cost. A baseline model is recommended to be captured as soon as possible. A comparison survey is recommended within 5 years (approx. 2028) which will provide a clear indication of recession rates. From this information, the survey interval may be adjusted (e.g. to ~10 years) if appropriate.

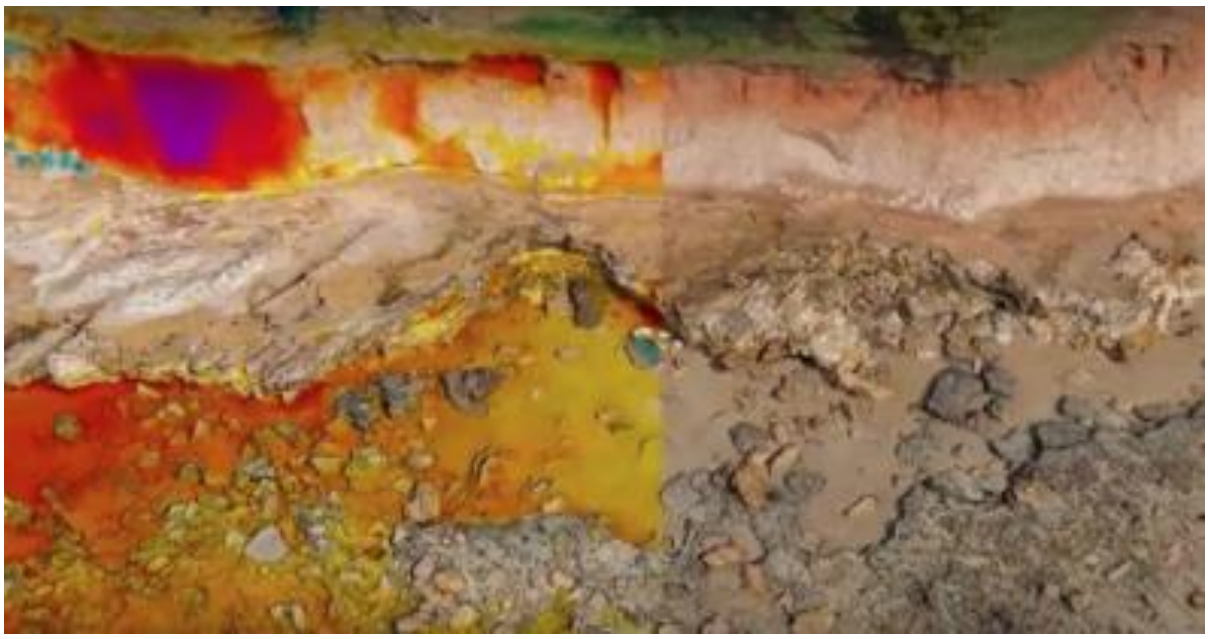

Figure 5: Example of 3-D mapping of changes to a cliffed coastline (i.e. shoreline bottom of photo, cliff top of photo) (Aerometrex)

3 Engagement plan

Council previously engaged with its community on the Coastal Adaptation Study. The study assessed the extent of coastal erosion and inundation to 2100 and presented adaptation options for different stretches of the Coast. The engagement began a conversation with the community to build understanding about how Council and the community might work together to adapt to projected climate change impacts.

It is important to Council to continue the conversation with its community about coastal adaptation through the implementation of the Coastal Adaptation Plan.

The Coastal Adaptation Plan lists recommended tasks for different cells (or sections) of the coastline under the categories of and "Engagement".

An Engagement Plan has been prepared to provide a recommended approach for the delivery of "Engagement" tasks from the Adaptation Plan as well as engagement recommended to support the other task categories (ie. "Planning", "Assessment", "Physical Works"). The Engagement Plan provides direction in two parts:

- Guidance for project-wide engagement
- Short term location specific engagement actions

3.1. Guidance for project wide engagement

The Engagement Plan provides guidance on how to undertake engagement for coastal adaptation across the whole project. It includes a stakeholder assessment to identify the types of people, groups and organisations with an interest or that are impacted by coastal adaptation and what their engagement needs are. It includes guidance for engagement to promote the investment and efforts of Council to build reputation and trust with community, and for monitoring, assessment, planning and physical works tasks categories.

Table 5: Summary of project wide engagement objectives and activities

Task type	Key engagement objective	Engagement activities
Project wide engagement	To promote the coastal adaptation investment and efforts of Council to build reputation and trust with community	• Coastal adaptation section on the website. • Council wide Coastal Adaptation Reference Group • Regular engagement with Ngarrindjeri • Sign up for updates via the webpage • Include articles in local papers • Establish a catchy name or "brand" (e.g. Our Adaptive Coast)
Monitoring tasks	To provide informative materials to share the results to maintain transparent process and assist in building the case for implementing adaptation options when required	• Website updates • Fact sheets • Maps
Assessment tasks	To capture what community value about their coast and seeking feedback on potential adaptation options	• Meeting with Coastal Adaptation Reference Group • Meeting with Ngarrindjeri Traditional Owners • 1x1 meetings with directly impacted properties • Fact sheet • Online Survey • Pop-up in location with information posters about the risk and planning process to date

Planning tasks	To involve stakeholders early in the development of a master plan and to get feedback on a draft master plan once prepared	• See Horseshoe Bay for example in below table
Physical works tasks	To provide information to community about what is proposed to be constructed, understanding their needs during construction and providing notification and updates on the progress of the works	• Project webpage • Fact sheets and FAQs • Design images • Meetings/pop-ins with people impacted • Early Information session • Site information signage • Works notifications • Progress updates • Stakeholder database • Stakeholder reference groups (if required) • Regular updates to Coastal Adaptation Reference Group, Elected Members. • Involvement of Ngarrindjeri in cultural interpretation and employment

3.2. Short term location specific actions

The Engagement Plan provides guidance for implementation of engagement tasks that the Coastal Adaptation Plan indicates as needing to commence "now" for specific locations or "cells". It includes engagement objectives, key messages and activities to guide engagement for Mundoo Channel, Goolwa Channel, Horseshoe Bay and Boomer-Knight Beach.

Table 6: Summary of short term specific engagement actions

Cell	Key engagement objective	Engagement activities
Mundoo Channel and Goolwa Channel	Communication of flood risk to community and stakeholders and discussion of adaptation options and development of Flood Emergency Plans with community and stakeholders.	• Set up Community Reference Group and hold meetings • Staff meeting • State Government Meeting(s) • Project webpage • Fact sheet • Letter to property owners/occupiers • Owner/occupier workshops x3 to inform and prepare plan • Owner/occupier survey
Horseshoe Bay	Communication of coastal erosion risk to community, Council building lessees and stakeholders and preparation of a Master Plan with community and stakeholders	• Set up Community Reference Group and hold meetings • State Government Meeting(s) • One on One meetings with lessees • Staff workshops • Project webpage • Fact sheets • Meeting with Ratalang Basham Beach and Horseshoe Bay Advisory Committee • Promotional materials for community engagement • Community surveys • Community workshops • Community engagement summary report
Boomer-Knight Beach	Communication of coastal erosion risk to trainline asset owners	• Letter to Railway Society and Crown Lands Program

The full Engagement Plan is presented in Appendix A.

4 Gap analysis

4.1. Approach

Based on the review of available data and CAS reports, a gap analysis to inform the CAP has been undertaken. The gap analysis includes an assessment of risk to the CAP if gaps are not filled.

The scale adopted to rate the relative importance and consequence of identified gaps on the ability to proceed and/or objectives of the CAP are presented in Table 7.

4.2. Key findings

The gap analysis identified several knowledge gaps. Given the stable nature of most of the Council's coastline the impact of these gaps on achieving the objectives of the CAP are generally low. To limit the longer-term impact to Council's coastal adaptation planning, triggers have been outlined to confirm when and how these knowledge gaps would need to be filled. The most common knowledge gaps identified include:

- **The consideration of midterm erosion risk (timeframes between present day and 2100, typically 2050)**

  SALGA Coastal Adaptation Planning Guidelines recommends "*given the CPB advises that 0.3m of SLR should be allowed for by 2050 and 1 m by 2100, climate risk assessment timeframes should as a starting point consider 2050 and 2100. Or in line with the design life of assets (typical 50 years or less.)*".

  In line with industry best practice and relevant guidelines an assessment of midterm erosion risk should be undertaken. The monitoring program will play an integral role in triggering this assessment for each management cell.

- **The consideration of risk to private properties**

  The CAS baseline assessment excluded private properties from the risk assessment process in some cells. In particular:

  - ***Boomers Beach:*** CAS assumes that private property would be afforded protection as these assets are behind the trainline which will be protected by State Government.
  - ***Middleton Beach***: CAS assumes that private property would be afforded protection as these assets are behind the esplanade (Surfers Pde) which will be protected by Council.

  Discussion with State Government representatives and Council has confirmed that these assumptions are not necessarily correct. All asset owners (including for private properties) should be informed of coastal risks.

- **The assessment of longer-term adaptation options**

  In line with adaptation planning best practice, an assessment of viable adaptation options need to be undertaken with consideration for all assets at risk. The steps typically involve:

  - Consideration for all viable adaption options (appropriate for the medium and longer term).
  - First past screening of options to consider effectiveness, costs (capital and ongoing), impact to environment, potential social impact.

- Engagement of all viable options with relevant stakeholders (i.e. Council, State Government and community). Engagement should present the tradeoffs of each adaptation option.
- Options to be assessed via a Multi Criteria Analysis (MCA).
- Following MCA, if the preferred pathway remains unclear, assessment via Cost Benefit Analysis (CBA) is recommended.

The full gap analysis is presented in Appendix B.

Table 7: Gap analysis ratings

Knowledge Gap Rating	Description of Relative Importance	Consequence
Low	Knowledge gap of limited consequence to the overall study objectives and/or the gap can be overcome by routine analysis or minimal additional collection efforts.	The detailed assessment can proceed, but additional data/information may need to be developed during the assessment.
Medium	A significant gap has been identified that is likely to have some bearing on the robustness of the analysis that can be undertaken and the ability to achieve the study objectives and/or the knowledge gap can be overcome but only with substantive additional analysis or data collection efforts.	An assessment of the ability to fill the knowledge gap and the value of the knowledge to the detailed assessment would need to be considered before proceeding with a detailed assessment.
High	A major gap has been identified that will significantly limit the robustness of the analysis that can be undertaken and significantly compromise the ability to achieve the study objectives and/or the knowledge gap can be overcome only by extensive additional analysis or data collection efforts.	The detailed assessment cannot proceed until this knowledge gap has been completed

5 Adaptation plans

As outlined in Section 1.1 the adaptation plan for each cell is contained in the Implementation Plans. Each adaptation plan provides a summary of context from the relevant CAS report including a summary of coastal processes, hazard rating, identified assets at risk now and in 2100 and an overview of the proposed adaptation pathway for the short, medium and longer term as set out in the CAS reports. Where appropriate, suggested changes have been made for proposed assets at risk and the adaption pathways in line with findings from the gap analysis and development of this CAP.

Table 8 below provides a summary of information provided in each adaption plan. A high-level summary of each adaptation plan is provided below. The detail of each plan is provided in the Implementation Plans and Appendix C.

Table 8: Description of information provided in adaptation plans

Item	Description
Management Cell	Cell number and name (e.g. Cell 1 – Mundoo Channel)
Task Type	Task types, categorised as follows: • Monitoring (refer Section 2) • Engagement (e.g. communication of risk to relevant stakeholders) • Planning (e.g. the relocation of assets, amendments to planning code) • Physical works (e.g. levee design and construction, dune strengthening) • Assessment (e.g. further quantification of risk or assessment of viable adaption options)
Task ID	Each task has been assigned a unique Task ID for the purpose and ease of referencing (triggers, gaps, preceding tasks).
Task Name	A short description of the task
Task Description	Scope of the task (what needs to be undertaken) and, where appropriate, the trigger for actioning the task.
Timing / Trigger	Outlines when the Council needs to undertake the task. This may refer to a defined trigger, preceding task (Task ID) or a defined time (e.g. now or as soon as funds are available).
Responsibility	Outlines the proposed person or organisation to undertake the scope. This typically includes a defined “Lead” and “Support”.
Indicative Cost	Outlines the likely cost rating associated with the task. Cost criteria are set out in Table 1.

5.1. Cell 1- 2 Murray Estuary Settlements

Coastal adaptation context		
Coastal setting	Mundoo Channel and Goolwa Channel settlements are located on the seaside of the barrage. The terrain is described as a 'sand flat' at elevations generally less than 2m AHD.	
Hazard rating	Erosion	High
	Inundation	High
Assets at risk	Current risk (2020)	Public Infrastructure (Moderate), Private Assets (Moderate)
	Future risk (2100)	Public Infrastructure, Private Assets, Eco-system disruption
Adaptation options	Short term (2020)	Planning and protect
	Medium term (2050)	Protect
	Long term (2100)	TBD

	Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Cell 1 Mundoo Channel	Monitoring	M.1 - M4	Short and longer term monitoring	As set out in Section 2		
	Engagement	1.1	Communicate flood risk to private property owners	Now	**Lead:** Council **Support:** Engagement specialist	Low
	Planning	1.2	Flood Emergency Plan	Completion of 1.1	**Lead:** Community **Support:** Council	Low
	Physical works	1.3	Levee design and construct	Completion of 1.1	Engineer and Civil Contractor	High
	Assessment and Planning	G2.a	Confirmation of longer term adaptation pathway	In conjunction of planning phase of Task 1.3	**Lead:** Council **Support:** Coastal specialist	Low

	Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Cell 2 – Goolwa Channel	Monitoring	M.1 - M4	Short and longer term monitoring	As set out in Section 2		
	Engagement	2.1	Communicate flood risk to land owners and state government	Now	**Lead:** Council **Support:** Engagement specialist	Low
	Planning and Physical works	2.2	Levee design and construction (to address current risk)	Completion of 2.1	**Lead:** Council / Community / State government **Support:** Engineer and Civil Contractor	High

	Planning and Physical works	**2.3**	**Sugars Beach Project**	Now	**Lead:** Council **Support:** Engineer and Civil Contractor	**Medium**
	Planning and Physical works	**2.4**	**2050 Flood protection design and construction**	Completion of 2.2, commence planning and undertake works when funds available.	**Lead:** Council **Support:** Engineer and Civil Contractor	**Medium**
	Assessment and Planning	**G2.a**	**Confirmation of longer term adaptation pathway**	When funds become available (10-15 years)	**Lead:** Council **Support:** Various	**Medium**

Coastal adaptation context – Beacon 19		
Coastal setting	Beacon 19 boat ramp facility is located near the Goolwa Barrage on the south side of the Murray estuary. Flows of water in the area	
Hazard rating	**Erosion**	Low
	Inundation	High
Assets at risk	**Current risk (2020)**	Public Infrastructure
	Future risk (2100)	Public Infrastructure
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Protect
	Long term (2100)	TBD

	Task Type	**Task ID**	**Task Name**	**Timing /Trigger**	**Responsibility**	**Indicative Cost**
Beacon 19	**Monitoring**	**M.1 - M2**	**Short term monitoring**	As set out in Section 2		
	Planning and Physical works	**B.1**	**Low heigh levee detailed design and construct**	When funds become available (10-15 years)	**Lead:** Council **Support:** Various	**High**
	Assessment and Planning	**B.2**	**Confirmation of longer term adaptation pathway**	Now	**Lead:** Council	**Medium**

5.2. Cell 3 - Goolwa Beach

Coastal adaptation context		
Coastal setting	Goolwa Beach is situated on a dissipative high energy beach facing the Southern Ocean. Over seventy years the coast has remained relatively stable while going through its natural cycles of accretion and erosion. Over the last ten years the Middleton – Goolwa coastline has been undergoing accretion.	
Hazard rating	**Erosion**	High – Very High
	Inundation	-
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	Public Infrastructure
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor
	Long term (2100)	Managed retreat

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 - M4	**Short and longer term monitoring**	As set out in Section 2		
Physical works	3.1	**Goolwa SLSC dune and access reinstate**	As soon as funds available	**Lead:** Council **Support:** Coastal engineer	**Medium**
Planning	3.2	**Relocation of carpark and supporting unfractured**	Trigger defined	**Lead:** Council **Support:** Planning consultant	**Medium**

5.3. Cell 4 - Tokuremoar Reserve

Coastal adaptation context		
Coastal setting	Tokuremoar Reserve is situated behind low set dunes on Goolwa Beach. Goolwa Beach is situated on a dissipative high energy beach facing the Southern Ocean. Over seventy years the coast has remained relatively stable while going through its natural cycles of accretion and erosion. The CAS identified over the past ten years the Middleton – Goolwa coastline has been undergoing accretion.	
Hazard rating	**Erosion**	Very High
	Inundation	Medium
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	Ecosystem disruption
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor
	Long term (2100)	Managed retreat

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 - M4	**Short and longer term monitoring**	As set out in Section 2		
Assessment	G4.a	**Options assessment (consideration of ecosystems at risk behind dunes)**	Defined Trigger	**Lead:** Council **Support:** Coastal specialist	**Low**

5.4. Cell 5 - Middleton Beach

Coastal adaptation context		
Coastal setting	Middleton Beach is a high energy beach with backshores varying from low height dunes, to soft rock cliffs. The CAS identified that the shoreline has retreated 10 12m in places, but since 2006 the shoreline has showed signs of accretion. Most of the shoreline is in a similar position as that of 1949.	
Hazard rating	**Erosion**	High - Very High
	Inundation	-
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	Public Infrastructure, Public Safety, Private Assets
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor
	Long term (2100)	TBD* (

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 - M.4 and M.6	**Short and longer term monitoring**	As set out in Section 2		
Planning	5.1	**Engage with PLUS review (re: Surfers Pde)**	Now	**Lead:** Council	**Low**
Physical Works	5.2	**Stormwater management (Chapman Rd)**	Understood to commence this year	**Lead:** Council Commercial Contract	**Medium**
Assessment	G5.a	**Assessment of erosion (mid and longer term)**	Defined trigger	**Lead:** Council **Support:** Coastal specialist	**Low**
Assessment	G5.b	**Include private properties in risk assessment**	Defined Trigger	**Lead:** Council **Support:** Coastal specialist	**Low**
Planning and assessment	5.3	**Asset upgrade (Access stairs, carparks and amenities block)**	Defined Trigger	**Lead:** Council	**Low**
Assessment	G5.c	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)**	Defined Trigger	**Lead:** Council **Support:** Coastal specialist/ engagement specialist	**Low**

5.5. Cell 6 - Middleton Creek

Coastal adaptation context		
Coastal setting	Middleton Point is underpinned by reef, and bordered by sandstone outcrops which dissipate wave energy. The beach is backed by a small dune system in the east and an embankment in front of the carpark. Historical analysis indicates that the backshore of the beach is impacted by larger events and the backshore is likely to come under increasing pressure if seas rise as projected.	
Hazard rating	**Erosion** **Inundation**	Medium -
Assets at risk	**Current risk (2020)** **Future risk (2100)**	- Public Infrastructure, Private Properties*
Adaptation options	**Short term (2020)** **Medium term (2050)** **Long term (2100)**	Monitor Monitor East of Creek: Managed retreat West of Creek: *Adaptation option assessment recommended

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 - M4	**Short and longer term monitoring**	As set out in Section 2		
Planning	6.1	**Engage with PLUS review (Shorefront properties between Surf St and Mindacowie Tce)**	Now	**Council**	**Low**
Physical Works	6.2	**Surf St stormwater upgrade**	Defined trigger	**Lead:** Council **Support:** Engineer	**Medium**
Planning and assessment	6.3	**Asset upgrade (Access stairs, carpark) (east of Creek)**	Defined trigger	**Lead:** Council **Support:** Coastal specialist	**Low**
Planning	6.4	**Managed retreat of carparks (east of Creek)**	Defined trigger	**Lead:** Council **Support:** Planning consultant	**Medium**
Assessment	G5.a	**Include private properties in risk assessment (west of Creek)**	Defined trigger	**Lead:** Council **Support:** Coastal specialist and engagement specialist	**Low**
Assessment	G6.b	**Adaptation option assessment (west of Creek)**	Defined trigger	**Lead:** Council **Support:** Coastal specialist and engagement specialist	**Low**

5.6. Cell 7 - Ratalang Basham

Coastal adaptation context		
Coastal setting	Ratalang - Basham is a sandy shore, backed by dunes, protected from south west swells by Commodore Point. The CAS outlined that the beach has been stable over the past seventy-year period. The key recommendations for the CAS for dune strengthening works and access control have been completed.	
Hazard rating	**Erosion**	Medium
	Inundation	Medium
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	Environment
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor
	Long term (2100)	*Adaptation option assessment may be required

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 - M4	**Short and longer term monitoring**	As set out in Section 2		
Planning	7.1	**Adaptation option assessment**	Defined trigger	**Lead:** Council **Support:** Coastal specialist and engagement specialist	**Low**

5.7. Cell 8.1 - Horseshoe Bay

Coastal adaptation context		
Coastal setting	Horseshoe Bay is a reflective coarse sand beach bordered by granite headlands. The shoreline is backed by seawalls on western end, embankment in the centre, and dunes on eastern end. The CAS identified significant change to the nature of the beach (over the past 100 years) as dunes were more significant (mid-section to eastern end).	
Hazard rating	**Erosion**	High
	Inundation	Low
Assets at risk	**Current risk (2020)**	Public Infrastructure and natural assets (reserve)
	Future risk (2100)	Public Infrastructure (carparks, sewer and storm water infrastructure, walking paths, board walk, café, shelters, reserve furniture, toilet block)
Adaptation options	**Short term (2020)**	Eastern end - increase flexibility in the dunes. Western end - monitor and master planning
	Medium term (2050)	Eastern end - nourishment, Western end - protection*
	Long term (2100)	TBD*

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 – M6	**Short and longer term monitoring**	As set out in Section 2		
Assessment	8.1	**Dune restorations works (costings and technical spec)**	Now	**Lead:** Council **Support:** Coastal specialist	**Low**
Assessment	8.2	**Data collection and modelling study**	As soon as funds are available	**Lead:** Council **Support:** Coastal specialist	**High**
Engagement	8.3	**Initial consultation of intent for master planning**	Now	**Lead:** Council **Support:** Engagement specialist	**Low**
Design and Construct	8.4	**Upgrade of seawall for The Reserve Area (western end)**	Defined Trigger	Coastal Engineer and Civil Contractor	**High**
Planning	8.5	**Draft Master Plan**	Completion of 8.3 and 8.4	Planning consultant	**High**
Engagement	8.6	**Engagement of proposed Master Plan**	Completion of 8.5	Engagement specialist	**Medium**
Planning	8.7	**Finalise Master Plan**	Completion of 8.6	Various	**Medium**

5.8. Cell 8.2 - Green Bay

Coastal adaptation context		
Coastal setting	Green Bay is a rocky beach, underpinned by reef, and bordered by granite headlands. Historical analysis indicates that the back-shore of the beach has not, and is currently not being impacted by actions of the sea.	
Hazard rating	**Erosion**	Medium
	Inundation	No Risk
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	-
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor potential for protect
	Long term (2100)	TBD*

**Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.*

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 – M4	**Short and longer term monitoring**	As set out in Section 2		
Assessment	G8.2.a	**Adaptation options assessment**	Defined trigger	Coastal specialist and engagement specialist	**Low**

5.10 Cell 8.3 Crockery Bay

Coastal adaptation context		
Coastal setting	Crockery Bay is a rocky pocket beach, underpinned by reef, and bordered by granite outcrops. Historical analysis indicates that the backshore of the beach has not, and is currently not being impacted by actions of the sea.	
Hazard rating	**Erosion**	Medium
	Inundation	No Risk
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	Sewer infrastructure and some minor Caravan Park assets
Adaptation options	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor potential for protect
	Long term (2100)	Managed Retreat of sewer infrastructure and some minor Caravan Park assets

**Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.*

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 – M4	**Short and longer term monitoring**	As set out in Section 2		
Planning and Assessment	8.3.1	**Asset upgrade Caravan Park**	Defined trigger	**Lead:** Council **Support:** Coastal specialist	**Low**
Planning and Assessment	G8.3.a	**Managed Retreat of minor Caravan Park infrastructure**	Defined Trigger	**Lead:** Council **Support:** Coastal specialist	**Medium**

5.11 Cell 9 – Boomer Knight Beach

Coastal adaptation context		
Coastal setting	Boomer Beach is a reflective medium sandy beach. The beach is backed by sand dunes varying in height from 10m AHD (in west) to 18m AHD (in east). Historical analysis suggests that the backshore of the beach undergoes periodic accretion and rec ession over periods of decades. Currently the beach has been in an accretion cycle for ~10 years. Knight Beach is categorised as a reflective medium sandy beach, the beach is backed by cliffs 5-10m high of Pleistocene aeolianite or calcarenite. The bay is bedrock backed, a former sand dune now hardened, rising above 30m at 500m inland. Historical analysis suggests that the backshore of the beach has not and is currently not being im pacted by actions of the sea.	
Hazard rating	**Erosion** **Inundation**	Medium No Risk
Assets at risk	**Current risk (2020)** **Future risk (2100)**	- Public Infrastructure (trainline), Private Assets*
Adaptation options	**Short term (2020)** **Medium term (2050)** **Long term (2100)**	Monitor Monitor potential for protect *Retreat vs Protect pathway assessment required
*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.		

Task Type	Task ID	Task Name	Timing /Trigger	Responsibility	Indicative Cost
Monitoring	M.1 – M4	**Short and longer term monitoring**	As set out in Section 2		
Monitoring	G9.a	**Include Chiton Rocks - Watsons Gap in monitoring program**	As set out in Section 4		
Planning	9.1	**Engage with PLUS review (re: Barbara St)**	Now	**Lead:** Council	**Low**
Engagement	9.2	**Communicate risk to trainline asset owners**	Now	**Lead:** Council	**Low**
Assessment	G9.b	**Assessment of mid term erosion (e.g. 2050) risk**	Defined trigger	**Lead:** Council **Support:** Coastal specialist	**Low**
Assessment	G9.c	**Confirm assets at risk behind trainline**	Defined trigger	**Lead:** Council **Support:** Coastal specialist	**Low**
Assessment	G9.d	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)**	Defined trigger	**Lead:** Council **Support:** Coastal and engagement specialist	**Low**

6 Summary of priority actions

Below provides a summary of Council's priority actions identified in the CAP:

- **Establish coastal monitoring program**
  As described in Section 2 an established and embedded coastal monitoring plan into Council's operations is imperative to the success of the adaptation planning process.
  Council to review the proposed methods and frequencies as set out in Section 2, finalise the monitoring plan and commence the monitoring works. Consider the benefits and constraints of the qualitative photo monitoring program models to determine the best approach for Council.

- **Engage with the PLUS review process**
  To limit the further densification of identified future at risk areas, Council should request an amendment from the Attorney General's Department (Planning and Land Use Services) current planning code.
  Note that Council's Development Plan (General Section – Coastal Areas) contained coastal hazard risk planning policy that applied to these at risk areas. However, this was not translated into the new code. In this regard, requesting an amendment is a (relatively simple) correction process, to re-establish policy that existed prior to the reform. Specific areas include:
  - Surfers Pde (Middleton)
  - Shorefront properties between Surf St and Mindacowie Tce (Middleton Creek)
  - Barbara St (Boomer/Knight Beach)

- **Communicate risk to Crown and Railway Society regarding trainline, Boomer Beach**

  Provide written advice to State Government and Railway Society of findings of CAS. Highlighting potential risk to the trainline to erosion by 2100. Noting that Council intends to monitor and will inform of any changes to the known risks.

  If/when further assessment of viable adaptation options are to be considered, all relevant stakeholders and asset owners should be involved during this assessment.

- **Planning and engagement activities regarding current and future flood risk, Mundoo and Goolwa Channel (including Beacon 19)**

  The Murray estuary settlements are exposed to a considerate risk of coastal inundation. Whilst a protection strategy would support this area to 2050, the viability of these settlements beyond this timeframe is uncertain. The necessary engagement, planning and assessment works need to be pursued as a high priority. It is important to undertake engagement with relevant stakeholders prior to pursuing further investigation to confirm viable adaptation pathways to ensure all stakeholders are clear of the trades and fatal flaws of considered pathways. Specific tasks include:
  - Communicate flood risk to private property owners
  - Development of Flood Emergency Plan specific to Mundoo Channel
  - Levee design to address current and mid-term (2050) projected flood risk
  - Longer term adaption pathway assessment to confirm the viability of the settlements for the end of the century, to include:
    - Consideration for combined riverine and coastal impacts
    - Test all viable adaptation pathways including retreat

- Asses all viable pathways through an MCA and CBA process
- CBA analysis of future viability of Beacon 19 boat ramp

- **Data collection and modelling study, Horseshoe Bay (Port Elliot)**
  At the time of preparing this CAP, Council are considering undertaking a Master Planning process for Horseshoe Bay. To inform the proposed Master Planning, a data collection and modelling study is proposed to address the following objectives:
  1. Confirm the required setback (erosion buffer) for the medium (2030 – 2050) and longer term (2100).
  2. Test viable management options in terms of effectiveness.
  3. Assess the economic, social, environmental trade-offs of viable management options and present for consideration to key stakeholders and the community.

  Requirements for the study have been provided to Council in a Project Management Plan specific for the Study, also presented in Appendix D.
  Given the value of private and public assets at risk (estimated at $18M) it would be prudent to pursue this investigation irrespective of the master planning process proceeding.

- **Initial consultation with asset owners regarding the master planning process, Horseshoe Bay (Port Elliot)** Likely impacted asset owners require early and ongoing engagement, more specifically:
  - The Bowls Club, as the relocation of this will be paramount to the Master Planning process
  - The Flying Fish Café, consideration may need to be given to moving this during the Master Planning process

7 References

Western, M, Hesp, P, Bourman, R 2019a, Coastal Adaptation Study for Alexandrina Council, Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019b) Coastal Adaptation Study for Alexandrina Council (Cell SF 1-2 Murray Estuary) prepared by Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019b) Coastal Adaptation Study for Alexandrina Council (Cell SF3-4 Goolwa Beach) prepared by Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019d) Coastal Adaptation Study for Alexandrina Council (Cell SF5 Middleton Beach) prepared by Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019e) Coastal Adaptation Study for Alexandrina Council (Cell SF6 Middleton Creek) prepared by Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019f) Coastal Adaptation Study for Alexandrina Council (Cell SF7 Ratalang-Basham) prepared by Integrated Coasts, South Australia.

Western, M, Bourman, R., Hesp, P (2019g) Coastal Adaptation Study for Alexandrina Council (Cell SF8 Horseshoe Bay) prepared by Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019h) Coastal Adaptation Study for Alexandrina Council (Cell SF8 Port Elliot – Green Bay and Crockery Bay) prepared by Integrated Coasts, South Australia

Western, M, Bourman, R., Hesp, P (2019i) Coastal Adaptation Study for Alexandrina Council (Cell SF9 Boomer-Knight Beach) prepared by Integrated Coasts, South Australia

Appendix A: Engagement plan

Alexandrina Council
21ADL-1250
1 August 2022

Engagement Plan

Alexandrina Coastal Adaptation Plan

SHAPING
GREAT
COMMUNITIES

URPS

Alexandrina Coastal Adaptation Engagement Plan

1 August 2022

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Contents

1. Introduction

Alexandrina Council has prepared a Coastal Adaptation Plan to prepare its coastal communities for sea level rise and associated storm surges. It lists tasks, timings and responsibilities for adaptation measures. This Engagement Plan is a companion document to the Coastal Adaptation Plan.

The Coastal Adaptation Plan is the next step on in planning for adaptation following Council's Coastal Adaptation Study published in 20191.

1.1 Previous Coastal Adaptation Study engagement

Council previously engaged with its community on the Coastal Adaptation Study. The study assessed the extent of costal erosion and inundation to 2100 and presented adaptation options for different stretches of the Coast. The engagement began a conversation with the community to build understanding about how Council and the community might work together to adapt to projected climate change impacts. The engagement included:

- Online information about the Study and how to get involved as well as fact sheets about coastal processes and climate change projections
- Online feedback form to understand what people value about the coast, what they understand about coastal processes, the level of support for the Study
- Workshops at Goolwa/Middleton, Port Elliot/Boomer Beach, and Hindmarsh Island that presented the study findings and discussed local experiences with coastal erosion/inundation and the adaptation options.

The outcomes of the engagement can be viewed at:
alexandrina.sa.gov.au/connect/environment/coastaladaptation.

Council now wants to continue the conversation with community through engagement on the next step in the coast adaptation process – the Coastal Adaptation Plan.

1.2 Coastal Adaptation Plan engagement

The Coastal Adaptation Plan lists recommended actions for different cells (or sections) of the coastline under the categories of "Planning", "Assessment", "Physical Works", and "Engagement".

This Engagement Plan provides a recommended approach for the delivery of "Engagement" tasks from the Adaptation Plan as well as engagement recommended to support the other categories. It provides direction in two parts:

1. Guidance for project-wide engagement

   Guidance on engagement for coastal adaptation across the whole project and for location specific tasks.

2. Short term engagement actions

   Guidance for implementation of engagement tasks that the Coastal Adaptation Plan indicates as needing to commence "When funds become available (1-5 Years)". These are for the cells: Mundoo Channel, Goolwa Channel, and Horseshoe Bay.

[1] Western, M, Hesp, P, Bourman, R 2019, Coastal Adaptation Study for Alexandrina Council, Integrated Coasts, South Australia
https://www.alexandrina.sa.gov.au/__data/assets/pdf_file/0025/843154/1_alexandrina_coastal_mainreport.pdf

2. Guidance for engagement

The Coastal Adaptation Plan includes a range of task categories: “Monitoring” “Planning”, “Assessment”, “Physical Works”, and “Engagement”.

Although “Engagement” has its own task category, the other task categories will require some level of engagement.

This section provides high-level consideration for how engagement could be carried out for these other categories. It also suggests some project wide/adaptation plan wide actions for promoting and building awareness of Council’s overall approach to Coastal Adaptation.

2.1 Coastal adaptation engagement learnings

In 2021 the City of Holdfast Bay undertook a review of how engagement has been undertaken in coastal adaptation planning around Australia. Key learnings of the review are listed below and have been used to inform the engagement approach for Alexandrina.

- Engagement should have a broad reach to ensure that all those potentially affected are aware of the risks and planning process. However, only a smaller number may be interested in participating in the planning process. Finding community members within this smaller number that are knowledgeable (eg. planners, researchers), influential in their networks and building their capacity can be a way of broadening community support, understanding or involvement.
- A smaller number of people participating does not mean that engagement requires less effort. More targeted engagement is resource intensive because it requires lots of communication to build relationships, organise events as well as ongoing collaborative activities.
- Outside of the smaller group of people with a willingness to participate is a broader community that needs or wants to be made aware of the risks and planning process. Providing quality information that builds understanding can build trust in council and how it is addressing the challenge of coastal adaptation. Many people may simply be satisfied with information that assures them that council “has it in hand”.
- The challenge of coastal adaptation needs to be made relevant to the local community and this requires reliable quantifiable information. For instance:
  - Some may be aware of and are roused by immediate impacts noticed from storm surges. Information can be used to build understanding that these events are natural and part of the coastal cycle but are going to increase in frequency and severity.
  - Longer term impacts such as sea level rise are harder for people to engage with. It can seem intangible or too far away to be of concern. Moving language away from climate change and more to projected impacts and risks can be helpful.
- Engagement needs to be early and ongoing. Engagement early on risks and pathways can be a foundation for future engagement. It may smooth the water or provide a springboard for future engagement on more detailed site-specific responses.
- The scope and future implementation of the adaptation plan must be clear. For example, does it just apply to council infrastructure? What does it mean for residents and key stakeholders? How will decisions be made?

2.2 Project wide engagement

Council is making a significant investment in coastal adaptation. It is worthwhile promoting this to the community to build reputation and trust, especially given the efforts align well with Council's recent declaration of a "Climate Emergency" and previous engagement on the Coastal Adaptation Study. Suggested approaches could include:

- **Maintain the coastal adaptation section on the council website** and update it as projects commence in particular cells.
- **Regular engagement with Ngarrindjeri** through leader-to-leader meetings and working group meetings established under the Kungun Ngarrindjeri Yunnan (KNY) Agreement. These meetings could present progress with the Coastal Adaptation Plan and discuss any values, issues or opportunities relating to specific project sites.
- Enable people to **sign up for updates** relating to Adaptation Planning or it could more broadly be for climate change.
- Include **articles in local papers** of things council is doing or highlight the work of local community members or businesses.
- Establish a **catchy name or "brand"** that could be used to promote all that work Council is doing for coastal adaptation (eg. Our Adaptive Coast).
- **Establish an internal steering group** to ensure cross organisational understanding, involvement resourcing and decision making for adaptation projects.

2.3 Stakeholders

Type	Interest/Impact/Risk	Engagement needs
Coastal Adaptation Reference Group (recommended to be established)	• Provide advice on Council's adaptation response particularly engagement • Impact of adaptation options on environmental assets and communities	• Kept informed of process and present information at meetings
Elected Members	• Concern for constituents and desire that constituents are adequately engaged and supported • Support required to fund major works	• Kept informed of process • Invitation to community events
Council staff	• Manage assets and leases • Responsible for other strategic policy aims for Alexandrina, for example that need to be embed in the Horseshoe Bay Masterplan	• Credible information showing the risks now and into the future • Involvement in planning for adaptation response and masterplan preparation • Internal steering group
Ngarrindjeri	• Impacts to country and cultural sites • Opportunities for cultural interpretation and employment	• Leader-to-leader and working group meetings established under the Kungun Ngarrindjeri Yunnan (KNY) Agreement.
Council Advisory Groups • Ratalang Basham Beach and Horseshoe Bay Advisory Committee • Environmental Advisory Panel • Economic Development Advisory Panel • Climate Emergency Advisory Panel	• Impacts on public and private assets • Understanding about community response to study and adaptation options identified	• Engage via establishing new Coastal Adaptation Reference Group (see above) • Engage Ratalang Basham Beach and Horseshoe Bay Advisory Committee specifically for Horseshoe Bay or Basham Projects.

Type	Interest/Impact/Risk	Engagement needs
Coastal community groups • Port Elliot Town and Foreshore • Middleton Town and Foreshore • Goolwa and Districts Ratepayers Association	• Impacts on public and private assets • How adaptation options may be funded and impact on ratepayers	• Credible information showing the risks now and into the future • Direct contact to provide information and invite to participate • Face to face opportunities to share information, be heard and plan together
State Government Agencies and leaders • Coastal Protection Branch • Landscape Boards • Planning and Land Use Services (PLUS) • Dept. for Environment & Water	• Collaboration and funding opportunities • Permits for water affecting activities • Crown land impacts	• Kept informed of process and opportunity • Meet to discuss collaboration or implications
Conservation Groups • Hindmarsh Island Landcare • GWLAP • Goolwa Coastcare	• Impacts on environmental assets • Impact of adaptation options on environmental assets and opportunities for adaptation to support ongoing viability	• As above
Site specific property owners / occupiers	• Own or occupy land in project areas • Property or assets could be damaged or lost due to coastal erosion/inundation • Risks to health and safety associated with flood events • Concerns about loss of property value • Concern about potential for compulsory acquisition of land and associated recompense	• Credible information showing the risks now and into the future • Direct contact to provide information and invite to participate • Face to face opportunities to share information, be heard and plan together • Recognise potential sensitivity of information being presented and discussed and that it may be confronting for people • Refer section 3.1

Type	Interest/Impact/Risk	Engagement needs
Site specific lessees of council property/land • Bowling club • Café • Port Elliot SLSC	• Concerned about the long term viability of their operations (eg. location, access) • Potential concern that Council may end lease earlier than expected	• Face to face individual meeting to show genuine interest to engage, build relationship • Meet with before wider community engagement • Need to capture what is required for their operations into the future • Recognise potential sensitivity of information being presented and discussed and that it may be confronting for people • Refer section 3.2
Crown and Railway Society	• Specific risk to trainline in the longer term	• Inform about risks to train line and monitoring and future adaptation options • Refer section 3.3
Site specific users of community open space and facilities	• Want to continue to be able use the facilities into the future	• Ensure are aware of project through on-site signage • Provide easy way to share thoughts and ideas on the future
Site specific nearby residents and businesses	• Have a strong attachment to the Bay and a concerned about impact to the values of the Bay • Want to continue to be able use the Bay facilities into the future • Likely supportive of local clubs	• Provide information about the project to them directly • Provide easy way to share thoughts and ideas
Broader Alexandrina community	• Interest in how coastal planning is being conducted • Value the coast for its amenity, recreation and cultural significance	• Need to be able to access information online

2.4 Guidance for task categories

This section provides guidance on how to implement engagement as part of task categories in the Adaptation Plan. The high-level estimated costs for implementing the engagement are included in the indicative costs for each task listed in the Coastal Adaptation Plan.

2.4.1 *Monitoring tasks*

Recommended monitoring includes long term erosion monitoring tasks to measure incremental changes to the coast as well as short term monitoring to capture to impacts from storm events.

The community needs to be kept informed of the outcomes of monitoring and understand when certain triggers have been reached that require a different adaptation response.

Engagement associated with monitoring activities could include:

- Sharing the results of ongoing monitoring to community in easy-to-understand language and graphics (eg fact sheets and maps). Results could be shared on the website and via email updates to people registered to receive them.
- If monitoring results trigger a different adaptation response, effort should be made to reach those people/properties that may be impacted, and next steps included in communication to raise awareness and be sensitive of public concern. Sharing of the results will maintain a transparent process and assist in building the case for implementing adaptation options when required.

2.4.2 *Assessment tasks*

Once monitoring has identified that a specific point or trigger has been reached (e.g. a certain erosion extent or increase sea level rise), an assessment task may be required. Assessment tasks include technical modelling (coastal processes, storm induced and longer term erosion), adaptation options assessments to understand the costs, benefits, constraints and subsequent trade-offs. Options assessment need to consider community values for particular locations and acceptability (i.e. what they think is appropriate).

Engagement associated with assessment may be undertaken in two stages:

- Community values engagement

  Communicating that the trigger has been reached and that options need to be assessed to respond to the risk. To determine what options will work Council needs to understand what the community values about the location.

- Options engagement

  Presenting and seeking feedback on the option(s) that have been identified to manage the risk whilst best conserving community values.

  Engagement actions for both stages could include:

  - Meeting with Coastal Adaptation Reference Group
  - Meeting with Ngarrindjeri Traditional Owners
  - 1x1 meetings with directly impacted properties
  - Fact sheet
  - Online Survey
  - Pop-up in location with information posters about the risk and planning process to date

2.4.3 *Planning tasks*

Where development of a master plan has been identified by the Coastal Adaptation Plan, it is recommended that two stages of engagement are conducted:

- Early engagement should be conducted to understand community and stakeholder issues and opportunities to inform the master plan.
- Engagement to get feedback on the draft plan.

Engagement efforts should focus on those impacted or with those with most interest in the project, whilst also ensuring the broader community is aware. The engagement approach for Horseshoe Bay (see section 3.2) provides an example of an engagement process for a master plan.

2.4.4 *Physical works tasks*

Where construction works are identified it is assumed that the directly impacted community would have been made aware of the need for the works or may have been involved in assessment of a preferred option (eg. in planning or assessment tasks).

Engagement activities associated with physical works could include:

- Creating project webpage for project information, updates, contact details.
- Creating project flyer with FAQs about the project (eg. what is being constructed, why, how, how impacts will be managed, broad timeframes, phone number and email for enquiries and complaints).
- Concept design/plan drawing of what is being built in a format community an understand.
- Initial meetings, drop-ins with adjacent businesses/residents/properties to understand their needs so that they can be factored into the construction process.
- Information session for impacted businesses and residents so they can understand the project and process and ask questions (approx. one month before works start).
- Site signage informing wider community of what is happening.
- Advance notice of any works directly adjacent a property and that may affect access (eg. letter/email at least two weeks prior).
- Regular updates on progress of works. What has been completed, what is happening next.
- Establish database of stakeholders, enquiries and complaints and engagement activities.
- Establishing a reference group if works are affecting a specific community or group of shops.
- Regular updates to Coastal Adaptation Reference Group, Elected Members.
- Involvement of Ngarrindjeri in cultural interpretation and employment.

3. Short term engagement actions

This section outlines recommended engagement approaches for the cells which the Coastal Adaptation Plan assigns tasks that need to commence 'when funds become available (1-5 Years): Mundoo Channel (Cell 1, Task 1.1, 1.2); Goolwa Channel (Cell 2, Task 2.1); Horseshoe Bay (Cell 8) and Boomer Knight Beach (Cell 9, Task 9.1).

3.1 Mundoo Channel (Cell 1, Task 1.1) and Goolwa (Cell 2, Task 2.1)

The engagement for Mundoo Channel and Goolwa Channel could be combined/delivered together because both have the same engagement objectives, key messages and community engagement activities.

3.1.1 Coastal adaptation background

Mundoo Channel

The Coastal Adaptation Study[2] assigns a "high" hazard rating for erosion and inundation for the Mundoo Channel (Cell 1). There is a "moderate" current (2020) risk to the Mundoo Channel settlement's public infrastructure and private assets, which can be managed through planning and protection (levee) measures. By 2100 the Adaptation Study advises that if seas rise as projected by 2100, then the viability of the settlement is likely to be in doubt and a managed retreat strategy may be required.

The Coastal Adaptation Plan identifies the engagement task in the below table as requiring immediate action for Mundoo Channel. Sections 3.1.2 to 3.1.5 provide a proposed approach to deliver this engagement task.

Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative cost
1.1	Communicate flood risk and adaptation options to private property owners	• Outline risk specific to private properties, 2050 and 2100. Viable pathways discussion for the short and longer term. • Discuss requirements for Flood Emergency Plan and how this will be facilitated.	When funds become available (1-5 Years)	Lead: Council Support: Engagement specialist	Medium ($20-$100k)

Goolwa Channel

The Costal Adaptation Study assigned a "high" hazard rating for erosion and inundation for Goolwa Channel (Cell 2). There is a "moderate" current (2020) risk to the Goolwa Channel settlement's public infrastructure and private assets, which can be managed through planning and protection measures

[2] Western, M, Hesp, P, Bourman, R 2019, Coastal Adaptation Study for Alexandrina Council, Integrated Coasts, South Australia
https://www.alexandrina.sa.gov.au/__data/assets/pdf_file/0025/843154/1_alexandrina_coastal_mainreport.pdf

(levee, channel design). By 2100 the Adaptation Study advises that if seas rise as projected by 2100, then the viability of the settlement is likely to be in doubt and a managed retreat strategy may be required.

The Coastal Adaptation Plan identifies the engagement task in the following table as requiring immediate action for Goolwa Channel. Sections 3.1.2 to 3.1.5 provide a proposed approach to deliver this engagement task.

Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative cost
2.1	Communicate flood risk and adaptation options to private property owners and state government	• Outline 2050 and 2100 risk specific to relevant stakeholders. Viable pathways discussion for the short and longer term: – Coolinda Road Settlement (landowners) – Mills Road Settlement (landowners) – Goolwa Channel Drive (landowners, State Government, Council) – Sugars Avenue (State Government).	When funds become available (1-5 Years)	Lead: Council Support: Engagement specialist	Medium ($20-$100k)

3.1.2 *Engagement objectives*

- To build property owner awareness of the Coastal Adaptation Plan and how Council is working with its community to ensure a resilient future.
- To continue the conversation on from the engagement undertaken on the Coastal Adaptation Study.
- To raise property owner and occupier awareness of the current risk (2020) to property, infrastructure and the environment at Mundoo Channel/Goolwa Channel associated with coastal erosion and inundation and projected risks in the medium (2050) and long term (2100).
- To discuss viable options to manage current flood risk and pathways for future adaptation
- To involve the community in the development of a Community Flood Emergency Plan.
- To build a trusting and working relationship between landowners and Council to facilitate future response to coastal adaptation requirements.

3.1.3 *Key messages*

- In 2020 Council commissioned a Coastal Adaptation Study to better understand how the impacts of climate change associated with sea level rise and erosion may affect Alexandrina Council's coastal locations into the future.
- In November 2020 Council presented the findings of the Study to the community and sought feedback on adaptation options to best manage coastal erosion and inundation.
- Alexandrina Council has now prepared a Coastal Adaptation Plan to respond to the risks of coastal erosion and inundation and to ensure the resilience our coastal communities and environments.
- The Plan identifies the level of risk for different sections of our coast now, in the medium and long term and associated adaptation needs.
- Mundoo Channel and Goowla Channel are identified as priority locations because they are low lying, on the seaside of the barrage and have high erosion and inundation (sea-flood) hazard.
- Council wants to work with Mundoo and Goolwa Channel property owners and occupiers to ensure that they are aware of the risks and to plan how we respond now and in the future.
- Council wants to start a conversation about risk acceptability and costs and benefits of future adaptation options including levee construction and managed retreat in the longer term.
- Emergency management is a shared responsibility between the community, Council and other stakeholders.
- Council wants to work with the Mundoo Channel and Goolwa Channel property owners and occupiers to prepare a Community Flood Emergency Management Plan that describes a whole of community approach that is relevant to everyone and helps the community to best prevent, prepare for, respond to and recover from flood emergencies.

It is noted that 'managed retreat' may be the only option in the long term. However, it is not appropriate to include that in the key messages. The key messages will be used to promote the project and seek participation. Putting messages about 'managed retreat' in the promotional messages may put participants 'off side' and defensive before the project has commenced. Instead, it is appropriate for the key messages to acknowledge that the location is a high inundation hazard area and council wants to shape a response with the community. The face-to-face engagement activities will then be used to provide suitable background context and build participant understanding before jumping to adaptation options (such as managed retreat).

3.1.4 *Engagement activities*

Activity + Description*	Stakeholders	Distribution	Resourcing
Community Reference Group Meeting • Meeting to present and seek feedback on project background, coastal risks, adaptation pathways, project process and engagement approach.	• Coastal Adaptation Community Reference Group	• Direct invitation	• Engagement consultant
Staff meeting • Meeting with relevant internal staff to present information about Council's Coastal Adaptation Planning process and the risks and pathways for Council land at Goolwa Channel. • Provide opportunity for questions and discussion.	• Council staff	• Internal email invitation	• Council staff
State Government Meeting(s) • Meeting with relevant state government staff to present information about Council's Coastal Adaptation Planning process • To discuss the risks and pathways for State Government land at Goolwa Channel (prepare digital presentation for meeting). Discuss the respective roles of Local Government versus State Government. • To discuss collaboration opportunities.	• State Government (Coast Protection Branch, Crown Land, Landscapes Board)	• Invitation by letter/email	• Council staff / engagement consultant

Activity + Description*	Stakeholders	Distribution	Resourcing
Webpage • Set up a specific page for Mundoo Channel/Goolwa Channel planning and action in the Coastal Adaptation section of Council's website. • This will be the page on which information about the project will be shared including fact sheets, reports, engagement activities. • The web address will be shared on all Mundoo Channel/Goolwa Channel communications.	• All	• Council website	• Council staff
Fact sheet • Create a fact sheet that presents easy to understand information and graphics about the risks specific to Mundoo Channel/Goolwa Channel and the pathways to adaptation (ie. Community Flood Emergency Plan, Levee, Managed Retreat) building on the previous fact sheets prepared for the Adaptation Study. • Make long term risks tangible and be open and transparent about current and future hazards and options. • Explain how Council wants to work with community to prepare and adapt.	• All	• In info pack sent to owner / occupiers • Webpage	• Council staff / engagement consultant

Activity + Description*	Stakeholders	Distribution	Resourcing
Letter • Prepare a letter to introduce the Adaptation Plan and invite to participate at Mundoo Channel/Goolwa Channel Workshop 1 (see below activity). • Attach the fact sheet.	• Property owners/occupiers	• In info pack sent to owner / occupiers	• Council staff / engagement consultant
Workshop 1 – project introduction and discussion forum • Workshop to present and discuss an expansion of fact sheet content and to provide the opportunity to ask questions and discuss. • Start a conversation about flood risks and acceptability. • Collect email addresses.	• Property owners/occupiers • Elected Members (observers) • Hindmarsh Island Landcare • Goolwa and Districts Ratepayers Association	• Invitation sent with above letter	• Engagement consultant

Activity + Description*	Stakeholders	Distribution	Resourcing
Workshop 2 – Community Flood Emergency Plan (CFEP) • Present information about flood emergency management. Use State Emergency Service materials and approach to support planning about what to do before, during and after a flood. • Discuss existing issues and previous events and experiences at Mundoo Channel/Goolwa Channel • Present the results of the flood mapping • Inform the community and stakeholders about sea level rise projections and risks associated with inundation • Discuss flood risks and acceptability building on from previous workshop • Discuss current approaches to emergency management at Mundoo Channel/Goolwa Channel • Identify potential emergency management strategies at a community and individual level • Assess the community's current level of preparedness • Explain that the next steps will be to prepare the draft Emergency Management Plan	• Property owners / occupiers • Elected Members (observers) • State Government (inc SES) • Hindmarsh Island Landcare • Goolwa and Districts Ratepayers Association	• Invitation via email and direct letter as required	• Engagement consultant

Activity + Description*	Stakeholders	Distribution	Resourcing
Workshop 3 – Community Flood Emergency Plan (CFEP) • Discuss and confirm the content of the draft CFEP • Review the template for household emergency management plans and undertake development of household plans • Discuss any outstanding issues or gaps in knowledge or supporting infrastructure • Discuss the implementation of the CFEP	• Property owners / occupiers • Elected Members (observers) • State Government (inc SES) • Hindmarsh Island Landcare • Goolwa and Districts Ratepayers Association	• Invitation via email and direct letter as required	• Engagement consultant
Survey – draft Community Flood Emergency Plan (CFEP) • Create a survey to get feedback from owners/occupiers on the draft CFEP for those unable to attend workshop 3	• Property owners/occupiers • Hindmarsh Island Landcare • Goolwa and Districts Ratepayers Association	Draft Plan and survey link on webpage. OR hard copy of plan and survey printed and sent to all owner / occupiers with reply paid envelope	• Engagement consultant
Letter and Community Flood Emergency Plan • Send letter and link to final Flood Emergency Plan to all property owners/occupiers	• Property owners/occupiers • Hindmarsh Island Landcare • Goolwa and Districts Ratepayers Association	• Hard copy via post and email	• Council staff

*Note: High-level cost estimate for all activities has been included in the indicative cost in the table at 3.3.1.

3.1.5 *Other future engagement*

It is assumed that all future engagement will re-connect with owners and occupiers who have participated in the above tasks.

The Coastal Adaptation Plan identifies the following tasks for Mundoo Channel and Goolwa Channel that will also involve some engagement. See advice on engagement in planning and physical works in section 2.0.

Mundoo Channel

- Task 1.3 Levee design and construct.
- Task 1.4 Planning for managed retreat.

Goolwa Channel

The Coastal Adaptation Plan identifies the following tasks for Goolwa Channel that will also involve some engagement. See advice on engagement in section 2.

- Task 2.2 Levee design and construct (Goolwa Channel Drive, Mills Road, Cooinda Road)
- Task 2.3 Sugars Avenue Masterplan
- Task 2.4 Additional flood management dependent on level of investment in 2.2
- Task 2.5 Longer term accommodation of sea level rises (eg modelling and construction of distributary channels)
- Task 2.6 Planning for managed retreat.
- Task A.3 Long term monitoring.

3.2 Horseshoe Bay (Cell 8, Tasks 8.4, 8.6-8.8)

3.2.1 *Coastal adaptation background*

The Coastal Adaptation Study assigns a “high” hazard rating for coastal erosion at Horseshoe Bay (Cell 8). There is current erosion risk to public and private infrastructure and the natural assets (the reserve), which is proposed to be managed through dune restoration at the eastern end of the beach and works to the existing seawall at the western end. By 2100 the Adaptation Study advises that the car parks, sewer and stormwater infrastructure, walking paths, stone walls, board walk, café, shelters, toilet block and reserve furniture will be at extreme risk. The Coastal Adaptation Study recommended that the Port Elliot Bowling Club (Council property) will need to be relocated to allow its current footprint to accommodate the public reserve and erosion buffer.

The Coastal Adaptation Plan proposes further modelling to confirm with measured data how the bay will naturally respond to sea level rise over time of the longer-term impacts of storm surge. The modelling will then be able to inform the required erosion set back buffers for infrastructure and assets in Council’s proposed Master Plan for the area. The proposed Master Plan will need to accommodate the public, private and community infrastructure within the confines of the modelled erosion set back buffer.

NOTE – it is understood that Council wishes to commence the Horseshoe Bay Master Plan in 2022. It is unlikely that the proposed erosion modelling would be completed to inform the Master Plan and the set back required for erosion buffers known. Preparing the Master Plan before the erosion modelling may require the Master Plan to be altered once model outputs are available.

The Coastal Adaptation Plan identifies the engagement tasks in the below table as requiring immediate action for Horseshoe Bay. Sections 3.2.2 to 3.2.4 provide a proposed approach to deliver these engagement tasks.

Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative cost
8.4	Initial consultation of intent for master planning	Paramount to the Master Planning process is the relocation of the Bowls Club. Consideration for moving café however this is of lower importance.	When funds become available (1-5 Years)	Engagement specialist	Low (<$20k)
8.6	Draft Master Plan	Based on outputs from modelling and also initial consultation with relevant stakeholders develop draft Master Plan.	Completion of 8.3 and 8.4	Planning consultant	Medium ($20-$100k)
8.7	Engagement of proposed plan	Broader community and stakeholder engaging.	Completion of 8.6	Engagement specialist	Medium ($20-$100k)
8.8	Finalise Master Plan	Final design of foreshore area and dunes area for staged implementation.	Completion of 8.7	Planning consultant	Medium ($20-$100k)

3.2.2 *Engagement stages*

It is proposed to undertake the engagement over two stages:

Stage 1 - Early engagement to inform the draft Master Plan (it is assumed this is commenced after the coastal modelling has been completed)

Stage 2 - Engagement to get feedback on the draft Master Plan.

3.2.3 *Stage 1 - Early engagement to inform the draft Master Plan*

Engagement objectives

- To build property lessees' awareness of the Coastal Adaptation Plan and how Council is working with its community to ensure a resilient future.
- To continue the conversation on from the engagement undertaken on the Coastal Adaptation Study.

- To raise the awareness of the Port Elliot community and Horseshoe Bay lessees of the current risk (2020) to property, infrastructure and the environment at Horseshoe associated with coastal erosion and projected risks in the medium (2050) and long term (2100).
- To introduce preparation of a Master Plan as the next step required in planning for coastal adaptation at Horseshoe Bay.
- To involve property lessees in Horseshoe Bay and the Port Elliot community in the development of the Horseshoe Bay Master Plan.
- To manage reputation risk by building a trusting and working relationship with lessees and community to facilitate future response to coastal adaptation requirements.

Key messages

- Horseshoe Bay is a much-treasured location for locals, tourists, businesses and members of the Port Elliot Surf Life Saving and Bowling Clubs. People enjoy the bay's natural values, jetty, cafe, playground, and community facilities.
- In 2020 Council commissioned a Coastal Adaptation Study to better understand how the impacts of climate change associated with sea level rise and erosion may affect Alexandrina Council's coastal locations into the future. In November 2020 Council presented the findings of the Study to the community and sought feedback on adaptation options to best manage coastal erosion and inundation.
- Alexandrina Council has now prepared a Coastal Adaptation Plan to respond to the risks of coastal erosion and inundation and to ensure the resilience our coastal communities and environments. The Plan identifies required actions for different sections of our coast now, in the medium and long term and what Council needs to do to adapt.
- Horseshoe Bay is at risk from coastal erosion. In the short (2020) and medium term (2050) this can be managed by dune restoration in the east of the bay and works to strengthen the existing sea wall in the west. However, by 2100, due to predicted rising sea level and increased storm surges, the reserve, buildings, car park and paths will be at extreme risk and not sustainable in their current format.
- Erosion modelling has indicated that permanent infrastructure and buildings will need to have a buffer between them and the shoreline to ensure they are protected. (*Note: erosion modelling at the time of drafting this engagement plan had not been completed. however, preparation of the Master Plan will start after the modelling has occurred so the key messages may need to be updated to refer to required erosion buffer)*
- As such, Council wants to work with the clubs, cafe and the community to prepare a Master Plan for the Bay's future. The Horseshoe Bay Master Plan will look at what facilities and features the community would like in Horseshoe Bay and will consider where these should be located for best use but also to ensure resilience from coastal erosion.
- Council wants to understand what do the community love about Horseshoe Bay now? How do you think it could be improved? What would you like to do or experience at the Bay in the future?
- Council is already meeting with the Surf Life Saving Club, Bowling Club, Cafe and other key groups to understand their needs and support their future operation.

Engagement activities

Activity + Description*	Stakeholders	Distribution	Resourcing
Community Reference Group Meeting • Meeting to present and seek feedback on project background, coastal risks, adaptation pathways, project process and engagement approach	• Coastal Adaptation Community Reference Group	• Direct invitation	• Engagement consultant
State Government Meeting(s) • Meeting with relevant state government staff to present information about Council's Coastal Adaptation Planning process • To discuss the risks and pathways for State Government land at Goolwa Channel (prepare digital presentation for meeting). Discuss the respective roles of Local Government versus State Government. • To discuss collaboration opportunities and how they would like to be involved in the project	• State Government (Coast Protection Branch, Crown Land, Landscapes Board)	• Invitation by letter/email	• Council staff/engagement consultant
HOLD POINT Should the modelling study show that the bowling club's location is in danger and relocation may be required. Council/Council Administration will need to have clear agreement that the Bowling Club needs to be relocated and cannot be accommodated on site. As well as clear agreement on the ways in which Council will support (or will not) finding a new location for the club.	• Council Exec.	• -	• Council staff

Activity + Description*	Stakeholders	Distribution	Resourcing
One on One meetings with lessees • Present erosion risk background and modelling • Present why master planning to accommodate an erosion buffer is the only viable long term adaptation response • Provide a good opportunity for them to talk and for council to listen. • Explain want to support lessees through the master planning process and best support future operations. • Bowling Club as above but also talk about process to find alternative location • SLSC clubrooms and café -as above but also discussing what they need for future operations	• Bowling Club • SLS Club • Flying Fish Cafe	• Direct invitation	• Engagement consultant
HOLD POINT 1x1 meetings need to be held with the Bowling Club, SLSC and café prior to proceeding to community engagement	• Council Exec	-	
Staff workshop • Meeting with relevant internal staff to present information about Council's Coastal Adaptation Planning process and the risks and pathways for Horseshoe Bay • Understand issues and opportunities for the future of the Bay	• Council staff	• Internal email invitation	• Council staff/ Engagement consultant
Webpage • Set up a specific page for the Master Plan in the Coastal Adaptation section of Council's website. • This will be the page on which information about the project will be shared including fact sheets, reports, engagement activities. • The web address will be shared on all Master Plan communications.	• All	• Council website	• Council staff

Activity + Description*	Stakeholders	Distribution	Resourcing
Fact sheet • Create a fact sheet that presents easy to understand information and graphics about the risks specific to the Bay and the pathways to adaptation. • Make long term risks tangible and be open and transparent about current and future hazards and options. • Explain how Council wants to work with community to prepare and adapt and shape a Master Plan that support community interests and environmental values.	• All	• Webpage	• Council staff / engagement consultant
Meeting with Ratalang Basham Beach and Horseshoe Bay Advisory Committee • Present erosion risk background and modelling (to be completed). Present why master planning to accommodate an erosion buffer is the only viable long term adaptation response • Present project process and how working with community and occupiers • Interactive activities to understand: the advisory group see as key issues and opportunities	• Ratalang Basham Beach and Horseshoe Bay Advisory Committee	• Direct invitation	• Engagement consultant
Promotional materials Provide information about the Master Plan process and how to have a say: • Site signage • Postcard/letter to Port Elliot community • Emails (stakeholder or engagement database) • Social media posts • Media release • Council banners • Posters in Council centres	• All	• Letter box drop	• Council staff

Activity + Description*	Stakeholders	Distribution	Resourcing
Community survey • Online survey to understand what do the community love about the Horseshoe Bay foreshore area? How do you think it could be improved? What would you like to do or experience at the Bay in the future?	• Nearby residents and businesses • Broader community • Bay Users • Occupiers	• Promotional materials	• Engagement consultant
Community workshop • Present erosion risk background and modelling (to be completed) • Present why master planning to accommodate an erosion buffer is the only viable long term adaptation response • Present project process and how working with community and occupiers • Interactive activities to understand: what do the community love about Horseshoe Bay now? How do you think it could be improved? What would you like to do or experience at the Bay in the future?	• Nearby residents and businesses • Broader community • Bay Users	• Promotional materials	• Engagement consultant
Community engagement summary report • Document how the community engagement was undertaken and what the key themes coming out of the engagement	• All	• On webpage • Email to stage 1 participants	• Engagement consultant

*Note: High-level cost estimate for all activities has been included in the indicative cost in the table at 3.2.1.

3.2.4 Stage 2 - Engagement to get feedback on the draft Master Plan

Engagement objectives

- To continue to involve property lessees in Horseshoe Bay and the Port Elliot community in the development of the Horseshoe Bay Master Plan.
- To seek feedback on the draft Horseshoe Bay Master Plan and understand the level of support for it and what refinements may be required.

Key messages

- In [*month, year*] Alexandrina Council started preparation of a Master Plan for Horseshoe Bay to identify how the Bay's open space, buildings and infrastructure can meet the needs of the community and can be resilient to the significant long term impacts coastal erosion predicted for the Bay.
- The Master Plan has been informed by modelling that has identified the area of land required for a buffer to accommodate future erosion.
- Council met with Horseshoe Bay's clubs and café to understand their operational needs and ran an online survey and workshop to understand what the community value about the Bay and how it could be improved for future use.
- The draft Horseshoe Bay Master Plan has been completed and Council wants the feedback of community and stakeholders to understand the level of support for the draft Master Plan, what is liked, and what could be improved.
- The feedback received will be considered by Council and used to finalise the Master Plan.

Engagement activities

Activity + Description*	Stakeholders	Distribution	Resourcing
Staff workshop • Meeting with relevant internal staff to present draft and get feedback	• Council staff	• Internal email invitation	• Council staff /engagement consultant
Community Reference Group Meeting • Meeting to present and seek feedback draft Master Plan prior to public consultation	• Coastal Adaptation Community Reference Group	• Direct invitation	• Engagement consultant
One on One meetings with lessees • Meetings to present draft and get feedback	• Bowling Club • SLS Club • Cafe	• Direct invitation	• Engagement consultant
HOLD POINT • Make refinements from lessees to draft Master Plan before public consultation	• Council Exec.	-	
Meeting with Ratalang Basham Beach and Horseshoe Bay Advisory Committee	• Ratalang Basham Beach and Horseshoe	• Direct invitation	• Engagement consultant

Activity + Description*	Stakeholders	Distribution	Resourcing
• Meeting to present and seek feedback draft Master Plan prior to public consultation	Bay Advisory Committee		
Webpage • Update webpage with information about the draft and how people can provide feedback • Upload draft Master Plan and fact sheet	• All	• Council website	• Council staff
Fact sheet • Create a fact sheet that presents the key features of the draft and addressed any predicted concerns with the draft • This could be done through an annotated diagram of the draft Master Plan and a series of FAQs	• All	• Webpage	• Council staff /engagement consultant
Promotional materials Provide information about the draft Master Plan and how to have a say: • Site signage • Postcard/letter to Port Elliot community • Emails (stakeholder or engagement database) • Social media posts • Media release • Council banners • Posters in Council centres	• All	• Letter box drop	• Council staff
Community survey • Online survey to understand the level of support for the draft Master Plan, what people like, what people don't like and why	• Nearby residents and businesses • Broader community • Bay Users • Occupiers	• Promotional materials	• Engagement consultant

Activity + Description*	Stakeholders	Distribution	Resourcing
Community drop-in • Drop in session with displays set up showing key features of the draft Master Plan and address potential FAQs • Planners on hand to answer questions • Direct people to online survey to provide feedback	• Nearby residents and businesses • Broader community • Bay Users	• Promotional materials	• Engagement consultant
Community engagement summary report • Document how the community engagement was undertaken, the level of support for the draft Master Plan, what people like, what people don't like and why	• All	• On webpage • Email to stage 2 participants	• Engagement consultant

*Note: High-level cost estimate for all activities has been included in the indicative cost in the table at 3.2.1.

3.3 Boomer-Knight Beach (Cell 9, Task 9.1)

3.3.1 *Coastal adaptation background*

The Coastal Adaptation Study identifies an extreme erosion hazard to public infrastructure by 2100.

Erosion modelling indicates the dune at Boomer Beach may recede by 18-23m and the slope become increasingly unstable. This is likely to place the trainline at risk in the latter part of the century.

The Coastal Adaptation Plan identifies the engagement tasks in the below table as requiring immediate action for Boomer-Knights Beach. Sections 3.3.2to 3.3.4 provide a proposed approach to deliver this engagement tasks.

Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative cost
9.1	Communicate risk to trainline asset owners	• Provide written advice to Crown and Railway Society of CAS. Highlighting potential risk to the trainline to erosion by 2100. Councils intends to monitor and inform of any changes to the know risks. If/when further assessment of viable adaptation options are to be consider, all relevant stakeholders and asset owners will in involved during this assessment.	When funds become available (1-5 Years)	Lead: Council	Low / NA

3.3.2 *Engagement objectives*

- To build awareness of the Coastal Adaptation Plan and how Council is working with its community to ensure a resilient future.
- To continue the conversation on from the engagement undertaken on the Coastal Adaptation Study.
- To raise the awareness of the Railway Society and Crown Lands Program of the long term risk (2100) to railway infrastructure and the environment at Boomer Beach associated with coastal erosion.
- To manage reputation risk by building a trusting and working relationship with the Railway Society to facilitate future response to coastal adaptation requirements.

3.3.3 *Key messages*

- In 2020 Council commissioned a Coastal Adaptation Study to better understand how the impacts of climate change associated with sea level rise and erosion may affect Alexandrina Council's coastal locations into the future. In November 2020 Council presented the findings of the Study to the

community and sought feedback on adaptation options to best manage coastal erosion and inundation.

- Erosion modelling undertaken as part of the Coastal Adaptation Study indicates the dune at Boomer Beach may recede by 18-23m and the slope become increasingly unstable. This is likely to place the trainline at risk in the latter part of the century.
- Alexandrina Council has now prepared a Coastal Adaptation Plan to respond to the risks of coastal erosion and inundation and to ensure the resilience our coastal communities and environments. The Plan identifies required actions for different sections of our coast now, in the medium and long term and what Council needs to do to adapt.
- The Adaptation Plan identifies a number of monitoring actions that will collect data on the rate of change and allow the identification of thresholds that if reached will trigger action.

3.3.4 *Engagement activities*

Activity + Description*	Stakeholders	Distribution	Resourcing
• Letter to be sent from Council to Railway Society and Crown Lands Program informing of findings of Coastal Adaptation Study, implications for future of railway and proposed management response (monitor and act when threshold exceeded)	• Railway Society and Crown Lands Program	• Letter from Council	• Council staff

*Note: High-level cost estimate for all activities has been included in the indicative cost in the table at 3.3.1.

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Appendix B: Gap analysis

Alexandrina Council - Coastal Adaptation Plan

Gap Analysis

Knowledge Gap Ra	Description of Relative Importance	Consequence
Low	While a knowledge gap has been identified, it is considered to be of limited consequence to the overall study objectives and/or the gap can be overcome by routine analysis or minimal additional collection efforts.	The detailed assessment can proceed, but additional data/information may need to be developed during the assessment.
Medium	A significant gap has been identified that is likely to have some bearing on the robustness of the analysis that can be undertaken and the ability to achieve the study objectives and/or the knowledge gap can be overcome but only with substantive additional analysis or data collection efforts.	An assessment of the ability to fill the knowledge gap and the value of the knowledge to the detailed assessment would need to be considered before proceeding with a detailed assessment.
High	A major gap has been identified that will significantly limit the robustness of the analysis that can be undertaken and significantly compromise the ability to achieve the study objectives and/or the knowledge gap can be overcome only by extensive additional analysis or data collection efforts.	The detailed assessment cannot proceed until this knowledge gap has been completed

Management Cell	GapID	Gap Identified	Scope Required to Fill Gap	Overall Knowledge Gap Rating
Cell 1- 2 Murray Estuary Settlements	**G2.a**	**Confirmation of longer term adaptation pathway (including consideration for retreat)** The viability of the Goolwa Channel and Mundoo Channel beyond 2050 was considered for protection and accommodation options however retreat was not considered. In line with industry best practice all adaptation options should be considered and their benefits and constraints assessed.	Whilst the CAS stepped through potential pathways for both protection and accommodation options, the viability of retreat should also be considered. An adaptation pathways options assessment needs to be undertaken in line with method set out in G9.d above.	Medium
4 Tokuremoar Reserve	**G4.a**	**Assessment of viable adaptation options** The CAS idented this coastline is likely to recede by up to 108m by 2100. Presenting risk/change to the ecology within Tokuremoar Reserve. Also noting the potential threat to adjoining cells West (and to a lesser degree west). The CAS identified the various adaption strategies to mitigate this risk (e.g. low height levees, remediate dunes, sand bagging). A considered options assessment is required to confirm the appropriate pathway for this coastal setting.	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion within the next 10 years. The options assessment must take into consideration: - Erosion hazard mapping (i.e. likely position of coastline for short, medium and longer term). - All viable adaption options an their trade offs (benefits and constraints) and assessment of options via MCA - Engagement of proposed option with relevant stakeholders (e.g. CPB, community groups)	Low
5 Middleton	**G5.a**	**Assessment of erosion (mid and longer term)** Quantitative assessment approach for future erosion not undertaken. Unclear how erosion buffers where determined to confirm assets at risk. Also mid term (e.g. 2050) erosion risk not assessed.	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion within the next 10 years. Erosion risk should be quantified through a setback assessment. Setback assessment to take in to consideration impact due to storm bight, underlying shoreline trends and impacts due to sea level rise in line with CPB Policy.	Low
	G5.b	**Include private properties in risk assessment** CAS made the assumption that private assets are afforded protection given they are behind the esplanade (Surfers Pde). Discussions with Council confirming this is an incorrect assumption the Esplanade would be protected at all costs. Assets (private properties) need to be included in the risk assessment.	**Trigger:** Completion of G5.a Private properties to be included in the risk assessment for a mid term planning horizon (typically 2050) and longer term (2100).	Low
	G5.c	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)** Given the potential assets at risk (private property, Council infrastructure), a more considered approach is required for the longer term adaptation planning in line with best practice.	**Trigger:** Gap5.b is undertaken. Assessment of viable adaptation pathways would follow. Assessment to be undertaken in line with method set out in G9.d above.	Low
6 Middleton Creek (West)	**G6.a**	**Include private properties in risk assessment** Possible erosion zone outlined in the CAS included the seaward end of private property allotments however private properties were not identified in the risk assessment.	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion within the next 10 years. All assets (including private properties) to be included in the risk assessment for a mid term planning horizon (typically 2050) and longer term (2100).	Low
	G6.b	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)** Given the close proximity of private property to the identified assets at risk (walking path and carpark) however also the viable pathway of retreat for both the carpark and the walking trail a more considered approach is required for the longer term adaptation planning in line with best practice.	**Trigger:** Gap6.a is undertaken. Assessment of viable adaptation pathways would follow. Assessment to be undertaken in line with method set out in G9.d above.	Low
8 Horseshoe Bay	**G8.a**	**Assessment of mid term erosion (e.g. 2050) risk** SALGA Coastal Adaptation Planning Guidelines recommends "given the CPB advises that 0.3m of SLR should be allowed for by 2050 and 1 m by 2100, climate risk assessment timeframes should as a starting point consider 2050 and 2100. Or in line with the design life of assets (typical 50 years or less.)"	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion within the next 10 years. (i.e. Increased impact to the backshore and frequent breach of dunes). Erosion risk should be quantified through a setback assessment. Setback assessment to take in to consideration impact due to storm bight, underlying shoreline trends and impacts due to sea level rise in line with CPB Policy.	Low
	G8.b	**Stormwater impacts** The CAS identified the need to better understand the risk of the combined effect of a rain event and a storm tide event.	CAS outlining " The key factor to be considered is the size of the catchment and the method of disposal. The topography of the bay means that dealing with storm water is difficult" Council need to consider stormwater design and outfall locations in the future Master Planning of Horseshoe Bay. Pre-planning and assessment to include probability analysis for extreme events (catchment generated flooding and storm events).	Medium
8.2 Green Bay	**G8.2.a**	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)** The CAS has assumed a protection strategy, this needs to be tested against other viable pathways such as managed retreat of identified assets at risk.	**Trigger:** If monitoring identifies backshore is receding. All viable adaptation options should be screened for effectiveness and viable options assessed using a MCA (operational and capital costs, social and environmental impact, flexibility and effectiveness of option). These options need to be considered in light of identified assets at risk and the projected likely erosion setback (i.e. adequate buffers to account for projected recession).	Low

8.3 Crockery Bay	**G8.3.a**	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)** Given the assets at risk could easily be relocated. Consideration needs to be given to a retreat strategy of these asset prior to investment in protection.	**Trigger:** If longer term monitoring identifies backshore is receding and shoreline is encroaching towards sewer infrastructure or Caravan Park assets. 1. Identify all assets at risk. 2. Communicate risk to relevant stakeholders. 3. Plan for the relocation of assets (identify where and how assets at risk will be relocated). 4. If a retreat pathway is not viable, consideration for alternative viable pathways needs to be undertaken in line with method outline in G.9d above.	Low
9 Boomer - Knight Beach	**G9.a**	**Chiton Rocks - Watsons Gap** Coastline west of Boomers Beach was not included in the CAS. Council require understanding of risk to full length of coastline under their jurisdiction.	Include this section of coastline in monitoring program outlined in Section 3 of main report.	Low
	G9.b	**Assessment of mid term erosion (e.g. 2050) risk** SALGA Coastal Adaptation Planning Guidelines recommends "given the CPB advises that 0.3m of SLR should be allowed for by 2050 and 1 m by 2100, climate risk assessment timeframes should as a starting point consider 2050 and 2100. Or in line with the design life of assets (typical 50 years or less.)"	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion and increase impact observed of the backshore. Erosion risk should be quantified through a setback assessment. Setback assessment to take in to consideration impact due to storm bight, underlying shoreline trends and impacts due to sea level rise in line with CPB Policy.	Low
	G.9c	**Confirm assets at risk behind trainline** To better inform an adaptation pathway assessment, the full extent of assets at risk need to be considered. The CAS made the assumption that the trainline is likely to be protected by the State Government and therefore any asset behind this is not likely to be at risk. Given the State Government have not confirmed this assumption taking and the extreme risk posed to assets (including private property) in close proximity to the trainline, it would be prudent to include these assets in the risk assessment.	**Trigger:** Completion of G9.b To better inform an adaptation pathway assessment, the full extent of assets at risk needs to be considered. Once the erosion setback projections have been outline from G9.b all assets at risk need to be identified for a medium term (typically 2050) and 2100. This is likely to include private property, Council infrastructure such as roads, car parks, lighting, sewer and stormwater infrastructure.	Low
	G.9d	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)** Given the close proximity of the private properties to the trainline. In line with Adaptation Planning best practice, an assessment of viable adaptation options (e.g. retreat vs. protect) needs to be undertaken with consideration for all assets at risk. This is likely to include a number of private properties, Council assets such has roads, carparks, stormwater and lighting.	**Trigger:** Gap9.c is undertaken. Assessment of viable adaptation pathways would follow. Assessment to include: 1. Consideration for all viable adaption options (medium and longer term). 2. First past screening of options to consider effectiveness, costs (capital and ongoing), impact to environment, potential social impact. 3. Engagement of all viable options with relevant stakeholders (i.e. Council, State Government and Community). Engagement should present the trade offs of each adaptation option . Outcome of engagement is to understand social appetite for each option. 4. Options to be assessed via a Multi Criteria Analysis (MCA). If after a MCA there are two clear pathways with trade off benefits, these are to be assessed via a Cost Benefit Analysis (CBA) to support the option to be endorsed.	Low

Appendix C: Adaptation plans

Alexandrina Council - Coastal Adaptation Plan

Monitoring Plan

Task ID	Cell	Task Name	Task Description	Timing	Responsibility	Indicative Cost ($)
M.1	**All**	**Review SLR projections**	Request update from DEW CMB on SLR projections. Confirm if rate in line with existing policy (0.3m SLR by 2050 and 1m by 2100).	**2025 (repeat every 5 years)**	**Lead:** Council **Support:** CPB/DEW	**NA**
M.2	**All**	**Photo monitoring**	Photo monitoring to be captured biannually (March and October) and after storm events by Council officers or through Citizen Science program (community support). Further detailed provided in Section 2.4 of main report.	**Biannually (March, October) and post storm events**	**TBD**	**Low**
M.3	**All (except Cell 1 & 2 - Mundoo Murray)**	**Cross shore profile and aerial photo review**	DEW cross shore profiles and aerial photos should be obtained to compare against baseline established in 2020 CAS. This is considered an interim coastal monitoring report to inform future monitoring frequencies set out throughout this plan. This would need to be undertaken by a qualified coastal consultant and data acquired from DEW CMB. Further detailed provided in Section 2.5 of main report.	**2025 (repeat every 5 years)**	**Lead:** coastal specialist **Support:** DEW CMB	**Low**
M.4	**All (except Cell 1 - Mundoo)**	**LiDAR capture and review**	To monitor long term trend of erosion LiDAR aerial survey is to be captured to compare against Baseline (2018). LiDAR capture to include: - LiDAR and Imagery Data Acquisition - Processing - Delivery of LiDAR, DEM, Contours, Imagery - Ground Control Survey Comparison of the datasets to highlight areas of recession / accretion would need to be undertaken by a qualified coastal consultant.	**2028 (Every 10 years)**	**Commercial Contract** **Support:** coastal specialist	**Medium**
M.5	**Cell 8 - Horseshoe Bay**	**Seawall condition assessment**	Condition assessment of the Jetty rock revetment and the stone wall on the western end of Horseshoe Bay to be undertaken by a qualified coastal engineer. Condition assessment to provide recommendations for repair and or upgrades with associated costings.	**2025 (repeat every 5 years)**	Coastal engineer	**Low**
M.6	**Cell 5 - Middleton**	**3D modelling of cliff sections**	For the cliffed sections of coastline (east of Boetchetter Rd to Miami Bld) erosion trends would need to be monitored via 3D Model Aerial Survey, which would include : - Oblique Imagery Data Acquisition - Processing - Delivery of 2cm 3D Model - Ground Control Survey Quote form a commercial contractor confirmed this would be a five week program approx. between $5K - $10K.	**Capture Baseline, 2023 (Repeat every 5 years)**	Commercial Contract	**Low**

Cell 1- 2 Murray Estuary Settlements

Coastal Setting

Mundoo Channel and Goolwa Channel settlements are located on the seaside of the barrage. The terrain is described as a 'sand flat' at elevations generally less than 2m AHD.

Inherent Hazard Rating

Erosion	High
Inundation	High

Assets at risk

Current risk (2020)	Public Infrastructure (Moderate), Private Assets (Moderate)
Future risk (2100)	Public Infrastructure, Private Assets, Eco-system disruption

Adaptation overview

Short term (2020):	Planning and Protect
Medium term (2050):	Protect
Long term (2100):	TBD

Cell	Task Type	Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative Cost
Cell 1 - Mundoo Channel	**Monitoring**	**M.1 - M2**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.2. Specific interest for this cell is: - Increase in sea level rise	**As set out in M.1 - M.2**		
	Engagement	**1.1**	**Communicate flood risk to private property owners**	Communicate risk specific to private property (current and future risk). Discussion of viable pathways for the short and longer term. Discuss requirements for Flood Emergency Plan and how this will be facilitated. Further detailed provided in Section 3.1 of Engagement Plan (Appendix A).	When funds become available (1-5 years)	**Lead:** Council **Support:** Engagement specialist	**Medium**
	Planning and Engagement	**1.2**	**Flood Emergency Plan**	Council will need to work with the local community to make sure they are aware of the risks and mitigation measures. Particular attention paid to those with medical conditions and private properties were floor levels under projected flood levels are appropriately warned, and that consideration is given to managing the various risks associated with the possibility of flooding of access roads.	Completion of 1.1	**Lead:** Community **Support:** Council	**Low**
	Physical works	**1.3**	**Levee Design and Construct**	On the assumption it is resolved to pursue a protection strategy for 2050 through the engagement process (Task 1.1). Design and Construction of low height levees at the northern and southern ends of Mundoo Channel Settlements and fronting the 19 private properties.	Completion of 1.1	Engineer and Civil Contractor	**High**
	Assessment and Planning	**G2.a**	**Confirmation of longer term adaptation pathway**	As identified in the gap analysis, the assessment of viable longer term adaptation options needs to be undertaken (including the consideration for retreat). This needs to be undertaken for both the Mundoo and Goolwa Channel settlements in mind	In conjunction with planning phase of Task 1.3	**Lead:** Council **Support:** Coastal consultant	Low

Cell	Task Type	Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative Cost
2 - Goolwa Channel	**Monitoring**	**M.1 - M2 and M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.2 and M.4. Specific interest for this cell is: - Increase in sea level rise - height and nature of dune to the eastern side of Sugars Ave.	**As set out in M.1 - M.2 and M.4**		
	Engagement	**2.1**	**Communicate flood risk to land owners and state government**	Communicate current and future flood risk to landowners: 1. Cooinda Rd Settlement (landowners) 2. Mills Rd Settlement (landowners) 3. Goolwa Channel Dve (Landowners, State Government, Council) 4. Sugars Ave (State Government) Further detailed provided in Section 3.1 of Engagement Plan (Appendix A).	When funds become available (1-5 years)	**Lead:** Council **Support:** Engagement specialist	**Medium**
	Planning and Physical works	**2.2**	**Levee design and construction (to address current and mid term risk)**	On the assumption it is resolved to pursue a protection strategy by the shack owners to mitigate current flood risk. Design and construction of levees to concepts provided in the CAS. Further design work is required to determine length and to optimise design to limit requirement for future works to cater to 2050 risk. 1. Goolwa Channel Dve: earthen levee to height 2.1m AHD fronting Lot 15 - 21 2. Mills Rd : 205m Earthen levee adjacent to internal rd to heigh 1.9m AHD 3. Cooinda Rd: earthen levee to height 2.1m AHD positioned along the top of the riverbank	Completion of 2.1	**Lead:** Council / Community / State Government **Support:** Coastal Engineer and Civil Contractor	**High**
	Planning and Physical works	**2.3**	**Sugars Beach Project**	Through the master planning for the tourist park upgrade, the following needs to be considered: - the current flood risk if land is to be developed - required upgraded to the rock revetment east of the boat ramp - erosion control (sand bagging) to the south eastern end of Sugars Beach	Now	**Lead:** Council **Support:** Coastal Engineer and Civil Contractor	**Medium**

	Planning and Physical works	**2.4**	**2050 Flood protection design and construction**	**Trigger:** Depended on the level of investment (levee design lengths and heights determined in Task 2.2), upgrades may be required for: - Chappel Road and Bongalong Road - Murray Mouth Rd - Goolwa Channel Road - Sugars Ave	Defined trigger	**Lead:** Council **Support:** Coastal Engineer and Civil Contractor	**Medium**
	Assessment and Planning	**G2.a**	**Confirmation of longer term adaptation pathway**	As identified in the gap analysis, the assessment of viable longer term adaptation options needs to be undertaken. This would need to include the assessment into the viability of the use of 'distributary channels' to accommodate sea level rises to 2100. This would require dynamic modelling under a series of sea level rise scenarios. This would also need to consider the viability of managed retreat. To support assessment would require input from legal, planning and engagement.	When funds become available (10-15 years)	**Lead:** Council **Support:** Various	**Medium**

Beacon 19

Coastal Setting Beacon 19 boat ramp facility is located near the Goolwa Barrage on the south side of the Murray estuary. Flows of water in the area relate to the tidal regime at the Murray Mouth. Waters from the Goolwa Barrage are controlled and minor releases to the sea.

Hazard Rating
Erosion Low
Inundation High

Assets at risk
Current risk (2020) Public Infrastructure
Future risk (2100) Public Infrastructure

Adaptation overview
Short term (2020) Monitor
Medium term (2050) Protect
Long term (2100) TBD

Cell	Task Type	Task ID	Task Name	Task Description	Timing / Trigger	Responsibility	Indicative Cost
Beacon 19	**Monitoring**	**M.1 - M2**	**Short term monitoring**	Scope as outlined in M.1 - M.2. Specific interest for this cell is: - Increase in sea level rise - frequency of inundation to Barrage Rd	**As set out in M.1 - M.2**		
	Planning and Physical works	**B.1**	**Low height levee detailed design and construct**	In line with recommendations in the CAS, concept designs provided in CAS: - Install ~200m low height levee adjacent Beacon 19 Boat ramp Rd near barrages - Install ~110m low height levee at the major bend in the road (near boat ramp)	When funds become available (1-5 years)	**Lead:** Council	**High**
	Assessment and Planning	**B.2**	**Confirmation of longer term adaptation pathway**	As identified in the CAS, the longer term viability beyond 2050 needs to be considered. This assessment would need to include a cost benefit analysis of the Beacon 19 boat ramp for the community including community consultation. This task should be undertaken in conjunction with G2.a (confirmation of longer term adaptation pathway for Mundoo and Goolwa Channel).	When funds become available (10-15 years)	**Lead:** Council **Support:** Various	**Medium**

Cell 3 Goolwa Beach

Coastal Setting

Goolwa Beach is situated on a dissipative high energy beach facing the Southern Ocean. Over seventy years the coast has remained relatively stable while going through its natural cycles of accretion and erosion.

Over the last ten years the Middleton – Goolwa coastline has been undergoing accretion.

Hazard Rating

Erosion: High - Very High

Inundation: -

Assets at risk

Current risk (2020): -

Future risk (2100): Public Infrastructure

Adaptation overview

Short term (2020): Monitor

Medium term (2050): Monitor

Long term (2100): Managed retreat

Cell	Task Type	Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative Cost
3 - Goolwa Beach	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - Shoreline position - Sand volumes - Buffer fronting SLSC precinct -Cross shore profiles of interest: 615009 and 615011.	**As set out in M.1 - M.4**		
	Physical works	**3.1**	**Goolwa SLSC dune and access reinstate**	In line in recommendation from the CAS: Reinstate the dunes to the main access point of Goolwa Surf Life Saving Club and install a ramp over the dunes with an exit to the beach. It is recommended that the end be buried down below current sand levels so that if the coast returns to an erosion mode that the infrastructure will not be left stranded by falling sand levels.	As soon as funds available	**Lead:** Council **Support:** Coastal engineer	**Medium**
	Planning	**3.2**	**Relocation of carpark and supporting unfractured**	**Trigger:** If/when monitoring indicates the carpark is likely to be at risk. Begin planning the relocation/redesign of the SLSC carpark and subsequent infrastructure.	Trigger defined	**Lead:** Council **Support:** Planning consultant	**Medium**

Cell 4 Tokuremoar Reserve

Coastal Setting

Tokuremoar Reserve is situated behind low set dunes on Goolwa Beach. Goolwa Beach is situated on a dissipative high energy beach facing the Southern Ocean. Over seventy years the coast has remained relatively stable while going through its natural cycles of accretion and erosion.

The CAS identified over the past ten years the Middleton – Goolwa coastline has been undergoing accretion.

Hazard Rating

Erosion: Very High

Inundation: Medium

Assets at risk

Current risk (2020): -

Future risk (2100): Ecosystem disruption

Adaptation overview

Short term (2020): Monitor

Medium term (2050): Monitor

Long term (2100): Managed retreat

Cell	Task Type	Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative Cost
4 Tokuremoar Reserve	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - Increase in sea level rise - the beach and base of the escarpment - the impact of storm events - evidence of dune breach	**As set out in M.1 - M.4**		
	Assessment	**G4.a**	**Options assessment (consideration of ecosystems at risk behind dunes)**	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion and/or increased impact to the backshore is observed or dunes are breached. The options assessment must take into consideration: - Erosion hazard mapping (i.e. likely position of coastline for short, medium and longer term). - All viable adaption options an their trade offs (benefits and constraints) and assessment of options via MCA - Engagement of proposed option with relevant stakeholders (e.g. CPB, community groups)	**Defined trigger**	**Lead:** Council **Support:** Coastal consultant	**Low**

Cell 5 Middleton Beach

Coastal Setting

Middleton Beach is a high energy beach with backshores varying from low height dunes, to soft rock cliffs.

The CAS identified that the shoreline has retreated 10-12m in places, but since 2006 the shoreline has showed signs of accretion. Most of the shoreline is in a similar position as that of 1949.

Hazard Rating

Erosion: High - Very High

Inundation: -

Assets at risk

Current risk (2020): -

Future risk (2100): Public Infrastructure, Public Safety, Private Assets

Adaptation overview

Short term (2020): Monitor

Medium term (2050): Monitor

Long term (2100): TBD*

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative Cost
5 Middleton Beach	**Monitoring**	**M.1 - M.4 and M.6**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - Base of the escarpment fronting Chapman St carpark - Stormwater outfall at Chapman St - Coastline east of Tonga St - Undercut cliff adjacent to cliffs east of Boetchetter Rd to Miami Bld - Cross shore profiles of interest 615006	**As set out in M.1 - M.4 and M.6**		
	Planning	**5.1**	**Engage with PLUS review (re: Surfers Pde)**	It is understood that the Attorney General's Department (Planning and Land Use Services) will be reaching out to agencies and councils in soon for Miscellaneous Technical Amendments to Planning Code. Council should pursue a request for amendment for the purpose to prevent further densification of Surfers Pde, given the longer term erosion risk. The justification might be that Council's Development Plan (General Section – Coastal Areas) contained coastal hazard risk planning policy that applied to this site, but was not translated into the Code. And so applying the Coastal Areas Overlay is simply a correction, to re-establish policy that existed prior to the reform.	Now	**Lead:** Council	**NA**
	Physical works	**5.2**	**Stormwater management (Chapman Rd)**	Understood to have been complete Qualified engineer to design detention basin inline with concept design and costing provided in the CAS. Works to include reconfiguration of stormwater outfall to beach at Chapman Rd (including detention pond).	Understood to commence this year	**Lead:** Council **Commercial Contract**	**Medium**
	Assessment	**G5.a**	**Assessment of erosion (mid and longer term)**	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion within the next 10 years. Erosion setback assessment to include: - Calculation or consideration for storm bight (S1) - Confirm longer term trend is shoreline movement (S2) - Consideration for shoreline movement due to Sea Level Rise (S3 - Bruun Rule calculation) Setback estimates should be provided by mid and longer term erosion risks (2050 and 2100) - Output from assessment should include identification of all assets at risk (including behind Esplanade)	Defined trigger	**Lead:** Council **Support:** Coastal consultant	**Low**
	Assessment	**G5.b**	**Include private properties in risk assessment**	**Trigger:** G5.a is completed All assets should be identified withing the erosion zone, and subsequent risk ratings assigned (likelihood and consequence ratings) to inform longer term adaptation options.	Defined Trigger	**Lead:** Council **Support:** Coastal consultant	**Low**
	Planning and assessment	**5.3**	**Asset upgrade (Access stairs, carparks and amenities block)**	**Trigger:** If Council are considering replacing or upgrading the beach access stairs, car parks or amenity block. Consideration should be given to longer term erosion outlook. Qualified coastal consultant to undertake a setback assessment (G5.a) to confirm adequate buffer for the life of the asset.	Defined trigger	**Lead:** Council	**Low**
	Assessment	**G5.c**	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)**	**Trigger:** If G5.a and G5.b are completed. Assessment to be undertaken in line with method set out in G9.d (outlined in gap analysis).	Defined trigger	**Lead:** Council **Support:** Coastal consultant/ engagement specialist	**Low**

Cell 6 Middleton Creek

Coastal Setting

Middleton Point is underpinned by reef, and bordered by sandstone outcrops which dissipate wave energy. The beach is backed by a small dune system in the east and an embankment in front of the carpark. Historical analysis indicates that the backshore of the beach is impacted by larger events and the backshore is likely to come under increasing pressure if seas rise as projected.

Hazard Rating

Erosion	Medium
Inundation	-

Assets at risk

Current risk (2020)	-
Future risk (2100)	Public Infrastructure, Private Properties*

Adaptation overview

Short term (2020)	Monitor
Medium term (2050)	Monitor
Long term (2100)	East of Creek: Managed retreat West of Creek: *Adaptation option assessment recommended

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing /Trigger	Responsibility	Indicative Cost
6 Middleton Creek	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - the base of the escarpment in front of the carpark - the condition of the dunes in front of the walking trail -Sand levels at the base of Surf St (stormwater outfall impacts) -cross shore profiles of particular interest 615004 and 615007	**As set out in M.1 - M.4**		
	Planning	**6.1**	**Engage with PLUS review (Shorefront properties between Surf St and Mindacowie Tec)**	It is understood that the Attorney General's Department (Planning and Land Use Services) will be reaching out to agencies and councils in soon for Miscellaneous Technical Amendments to Planning Code. Council should pursue a request for amendment for the purpose to prevent further densification of shorefront properties between Surf St and Mindacowie Tec, given the longer term erosion risk. The justification might be that Council's Development Plan (General Section – Coastal Areas) contained coastal hazard risk planning policy that applied to this site, but was not translated into the Code. And so applying the Coastal Areas Overlay is simply a correction, to re-establish policy that existed prior to the reform.	Now	**Lead:** Council	**NA**
	Physical works	**6.2**	**Surf St stormwater upgrade**	**Trigger:** If monitoring program confirms further lowering of the beach at the Surf St outfall. Storm water diversion away from beach to outlet to rocky outcrop in line with proposed concept design in CAS. Detailed design to be undertaken by qualified engineer for tendering and construction purposes.	Defined trigger	**Lead:** Council **Support:** Engineer	**Medium**
	Planning and assessment	**6.3**	**Asset upgrade (Access stairs, carpark) (east of Creek)**	**Trigger:** If Council are considering replacing or upgrading either the beach access stairs or the car park. Consideration should be given to longer term erosion outlook. Qualified coastal consultant to undertake a setback assessment to confirm adequate buffer.	Defined trigger	**Lead:** Council **Support:** Coastal consultant	**Low**
	Planning	**6.4**	**Managed retreat of carparks (east of Creek)**	**Trigger:** If monitoring suggests recession is occurring beyond a typical cycle of erosion - accretion and shoreline encroaching on carparks. Suitable alternative location for carparks east of the creek to be confirmed.	Defined trigger	**Lead:** Council **Support:** Planning consultant	**Medium**
	Assessment	**G6.a**	**Include private properties in risk assessment (west of Creek)**	Possible erosion zone outlined in the CAS (west of the creek) included the seaward end of private property allotments however private properties were not identified in the risk assessment. **Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion within the next 10 years. All assets (including private properties) to be included in the risk assessment for a mid term planning horizon (typically 2050) and longer term (2100).	Defined trigger	**Lead:** Council **Support:** Coastal consultant and engagement specialist	**Low**
	Assessment	**G6.b**	**Adaptation option assessment (west of Creek)**	**Trigger:** Gap6.a is undertaken. Assessment of viable adaptation pathways would follow. Assessment to be undertaken in line with method set out in G9.d (Gap Analysis).	Defined trigger	**Lead:** Council **Support:** Coastal consultant and engagement specialist	**Low**

Cell 7 Ratalang Basham

Coastal Setting

Ratalang - Basham is a sandy shore, backed by dunes, protected from south west swells by Commodore Point.

The CAS outlined that the beach has been stable over the past seventy-year period.

The key recommendations for the CAS for dune strengthening works and access control have been completed.

Hazard Rating

Erosion	Medium
Inundation	Medium

Assets at risk

Current risk (2020)	-
Future risk (2100)	Environment

Adaptation overview

Short term (2020):	Monitor
Medium term (2050):	Monitor
Long term (2100):	*Adaptation option assessment may be required

*Not as referenced in CAS, change recommended due to gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing / Trigger	Responsibility	Indicative Cost
Cell 7 Ratalang Basham	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: -effectiveness of the three sections of dunes completed 2021 -cross shore profiles of particular interest 615003	**As set out in M.1 - M.4**		
	Assessment	**7.1**	**Adaptation option assessment**	**Trigger:** If monitoring suggests recession is occurring beyond a typical cycle of erosion - accretion. Increased impact to the backshore of the beach observed and/or evidence of dune breached. All viable adaptation options should be screened for effectiveness and viable options assessed using a MCA (operational and capital costs, social and environmental impact, flexibility and effectiveness of option). These options need to be considered in light of identified assets at risk (e.g. ecosystem) and the projected likely erosion setback (i.e. adequate buffers to account for projected recession).	Defined trigger	**Lead:** Council **Support:** Coastal consultant and engagement specialist	**Low**

Cell 8.1 Horseshoe Bay

Coastal Setting

Horseshoe Bay is a reflective coarse sand beach bordered by granite headlands. The shoreline is backed by seawalls on western end, embankment in the centre, and dunes on eastern end.

The CAS identified significant change to the nature of the beach (over the past 100 years) as dunes were more significant (mid-section to eastern end).

Hazard Rating

Erosion	High
Inundation	Low

Assets at risk

Current risk (2020)	Public Infrastructure and natural assets (reserve)
Future risk (2100)	Public Infrastructure (carparks, sewer infrastructure, storm water infrastructure, walking paths, stone walls and wooden board walk, café, shelters, reserve furniture, toilet block.)

Adaptation overview

Short term (2020)	Eastern end - increase flexibility in the dunes. Western end - monitor and Master Planning
Medium term (2050)	Eastern end - nourishment, Western end - protection*
Long term (2100)	TBD*

*Not as referenced in CAS, recommended change based on gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing / Trigger	Responsibility	Indicative Cost
8 - Horseshoe Bay	**Monitoring**	**M.1 - M6**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.6. Specific interest for this cell is: - beach and base of the escarpment - the impact of storm events in particular storm damage to mid section of Bay - Sand volumes in eastern end of Bay - response of dune over time to mid section and eastern end of Bay - cross shore profiles of particular interest 615002 - condition of Jetty revetment and stone wall - beach levels fronting stone wall post storm events	**As set out in M.1 - M.6**		
	Assessment	**8.1**	**Dune restorations works (costings and technical spec)**	Complete costings and technical design of dune restorations works. Noting the proposed works are considered to be a short term management approach (approx. 5 year). Council should consider the cost of this and timing of master planning prior to commitment to physical works.	Now	**Lead:** Council **Support:** Coastal consultant	**Low**
	Assessment	**8.2**	**Data collection and modelling study**	To inform the proposed Master Planning a data collection and modelling study is proposed to address the following objectives: The key objectives of the data collection and modelling study include: 1. Confirm the required setback (erosion buffer) for the medium (2030 - 2050) and longer term (2100). 2. Test viable management options in terms of effectiveness. 3. Assess the economic, social, environmental trade-offs of viable management options and present for consideration to key stakeholders and the community. Requirements of the study have been provided to Council in a Project Management Plan specific for the Study (Appendix D) Noting this would scope would address Gap 8.a and 8.b.	As soon as funds are available	**Lead:** Council **Support:** Coastal consultant	**High**
	Engagement	**8.3**	**Initial consultation of intent for master planning**	Likely impacted asset owners (as a result of the Master Planning process) require early and ongoing engagement, e.g.: - Paramount to the Master Planning process is the relocation of the Bowls Club - Consideration for moving café however this is of lower importance	Now	**Lead:** Council **Support:** Engagement specialist	**Low**
	Physical works	**8.4**	**Upgrade of seawall for The Reserve Area (western end)**	**Triggered:** Condition inspection (Task M6) has highlighted the need for remedial works for the seawall to sustain its function. Ideally this is undertaken in conjunction with any Master Planning works however if this is triggered prior to Master Planning works have commenced, engage coastal engineer for seawall design and civil contractor to undertake works.	Defined Trigger	Coastal Engineer and Civil Contractor	**High**
	Planning	**8.5**	**Draft Master Plan**	Based on outputs from assessment and also initial consultation (Task 8.2 and 8.3) with relevant stakeholders develop draft Master Plan.	Completion of 8.3 and 8.4	Planning consultant	**High**
	Engagement	**8.6**	**Engagement of proposed Master Plan**	Broader community and stakeholder engagement of Master Plan.	Completion of 8.5	Engagement specialist	**Medium**
	Planning	**8.7**	**Finalise Master Plan**	Final design of foreshore area and dunes area for staged implementation.	Completion of 8.6	Various	**Medium**

Cell 8.2 Green Bay

Coastal Setting

Green Bay is a rocky beach, underpinned by reef, and bordered by granite headlands. Historical analysis indicates that the back-shore of the beach has not, and is currently not being impacted by actions of the sea.

Hazard Rating	**Erosion**	Medium
	Inundation	No risk
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	Public Infrastructure
Adaptation overview	**Short term (2020)**	Monitor
	Medium term (2050)	Monitor potential for protect
	Long term (2100)	TBD*

*Not as referenced in CAS, recommended change based on gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing / Trigger	Responsibility	Indicative Cost
8 - 2 Green Bay	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - beach and base of the escarpment - the impact of storm events	**As set out in M.1 - M.4**		
	Assessment	**G8.2.a**	**Adaptation options assessment**	**Trigger:** If monitoring identifies backshore is receding All viable adaptation options should be screened for effectiveness and viable options assessed using a MCA (operational and capital costs, social and environmental impact, flexibility and effectiveness of option). These options need to be considered in light of identified assets at risk and the projected likely erosion setback (i.e. adequate buffers to account for projected recession).	Defined trigger	**Lead:** Council **Support:** Coastal consultant and engagement specialist	**Low**

Cell 8. 3 Crockery Bay

Coastal Setting

Crockery Bay is a rocky pocket beach, underpinned by reef, and bordered by granite outcrops.

Historical analysis indicates that the back-shore of the beach has not, and is currently not being impacted by actions of the sea.

Hazard Rating	**Erosion**	Medium
	Inundation	No risk
Assets at risk	**Current risk (2020)**	-
	Future risk (2100)	-
Adaptation overview	**Short term (2020):**	Monitor
	Medium term (2050):	Monitor potential for protect
	Long term (2100):	Retreat*

*Not as referenced in CAS, recommended change based on gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing / Trigger	Responsibility	Indicative Cost
8 - 3 Crockery Bay	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - beach and base of the escarpment - the impact of storm events	**As set out in M.1 - M.4**		
	Planning and Assessment	**8.3.1**	**Asset upgrade Caravan Park**	**Trigger:** If Council are considering replacing or upgrading Caravan Park Assets closest to the shoreline. Consideration should be given to longer term erosion outlook. Qualified coastal consultant to undertake a setback assessment to confirm adequate buffer.	Defined trigger	**Lead:** Council **Support:** Coastal Consultant	**Low**
	Planning and Assessment	**G8.3.a**	**Managed Retreat**	**Trigger:** If longer term monitoring identifies backshore is receding and shoreline is encroaching towards sewer infrastructure or Caravan Park assets. 1. Identify all assets at risk. 2. Communicate risk to relevant stakeholders. 3. Plan for the relocation of assets (identify where and how assets at risk will be relocated). 4. If a retreat pathway is not viable, consideration for alternative viable pathways needs to be undertaken in line with method outline in G.9d (gap analysis).	Defined Trigger	**Lead:** Council **Support:** Coastal consultant	**Medium**

Cell 9 Boomer - Knight Beach

Historical analysis suggests that the backshore of the beach undergoes periodic accretion and recession over periods of decades.
Currently the beach has been in an accretion cycle for ~10 years.

Coastal Setting

Knight Beach is categorised as a reflective medium sandy beach, the beach is backed by cliffs 5-10m high of Pleistocene aeolianite or calcarenite.
The bay is bedrock backed, a former sand dune now hardened, rising above 30m at 500m inland. Historical analysis suggests that the backshore of the beach ha s not and is currently not being impacted by actions of the sea.

Hazard Rating

Erosion Medium

Inundation No risk

Assets at risk

Current risk (2020) -

Future risk (2100) Public Infrastructure (trainline), Private Assets*

Adaptation overview

Short term (2020) Monitor

Medium term (2050) Monitor potential for protect

Long term (2100) *Retreat vs Protect pathway assessment required

*Not as referenced in CAS, recommended change based on gap analysis and in line with best practice.

Cell	Task Type	Task ID	Task Name	Task Description	Timing / Trigger	Responsibility	Indicative Cost
Cell 9 - Boomer and Knight Beach	**Monitoring**	**M.1 - M4**	**Short and longer term monitoring**	Scope as outlined in M.1 - M.4. Specific interest for this cell is: - beach and base of the escarpment - the impact of storm events - cross shore profile of interest 615001	**As set out in M.1 - M.4**		
	Monitoring	**G9.a**	**Include Chiton Rocks - Watsons Gap in monitoring program**	Coastline west of Boomers Beach was not included in the CAS. Council require understanding of risk to full length of coastline under their jurisdiction. Include this section of coastline in monitoring program as outlined in Section 3 of main report.	**As set out in M.1 - M.4**		
	Planning	**9.1**	**Engage with PLUS review (re: Barbara St)**	It is understood that the Attorney General's Department (Planning and Land Use Services) will be reaching out to agencies and councils in soon for Miscellaneous Technical Amendments to Planning Code. Council should pursue a request for amendment for the purpose to prevent further densification of Barbara St, given the longer term erosion risk. The justification might be that Council's Development Plan (General Section – Coastal Areas) contained coastal hazard risk planning policy that applied to this site, but was not translated into the Code. And so applying the Coastal Areas Overlay is simply a correction, to re-establish policy that existed prior to the reform.	Now	**Lead:** Council	**NA**
	Engagement	**9.2**	**Communicate risk to trainline asset owners**	Provide written advice to Crown and Railway Society of findings of CAS. Highlighting potential risk to the trainline to erosion by 2100. Councils intends to monitor and will inform of any changes to the know risks. If/when further assessment of viable adaptation options are to be consider, all relevant stakeholders and asset owners will require to be involved during this assessment.	Now	**Lead:** Council	**NA**
	Assessment	**G9.b**	**Assessment of mid term erosion (e.g. 2050) risk**	**Trigger:** If monitoring program suggest recession is occurring beyond a typical cycle of erosion - accretion and increase impact observed of the backshore. Erosion risk should be quantified through a setback assessment. Setback assessment to take in to consideration impact due to storm bight, underlying shoreline trends and impacts due to sea level rise in line with CPB Policy.	Defined trigger	**Lead:** Council **Support:** Coastal consultant	**Low**
	Assessment	**G9.c**	**Confirm assets at risk behind trainline**	**Trigger:** Completion of G9.b To better inform an adaptation pathway assessment, the full extent of assets at risk needs to be considered. Once the erosion setback projections have been outline from G9.b all assets at risk need to be identified for a medium term (typically 2050) and 2100. This is likely to include private property, Council infrastructure such as roads, car parks, lighting, sewer and stormwater infrastructure.	Defined trigger	**Lead:** Council **Support:** Coastal consultant	**Low**
	Assessment	**G9.d**	**Confirmation of longer term adaptation pathway (e.g. retreat vs. protect)**	**Trigger:** completion of G9.c. Execute scope as set out in G9.d. (gap analysis).	Defined trigger	**Lead:** Council **Support:** Coastal consultant and engagement specialist	**Low**

Appendix D: Horseshoe Bay data collection and modelling study

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Horseshoe Bay Data Collection and Modelling Study

Project Management Plan

Prepared for

ALEXANDRINA

May 2022

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Client	Alexandrina Council
Document title	Data Collection and Modelling Study – Project Management Plan

Rev	Date	Document number	Prepared	Reviewed	Approved
A	02/05/22	Initial draft for client review	Annabel Sandery	Brad Smith	Annabel Sandery

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1 Introduction

Alexandrina Council are planning to undertake a data collection and modelling study ('Study') to support the proposed Horseshoe Bay Master Planning and help Council future proof the Bay and its intrinsic value for the community, the associated assets and infrastructure.

This Project Management Plan (PMP) is to provide a clear program for the successful delivery of the Study, outlining the project method, schedule, risks and how they will be managed. This PMP also outlines the proposed monitoring and evaluation approach to ensure the key objectives of the Study will be achieved.

1.1. Purpose

The purpose of this PMP is to outline how the Study outcomes are intended to be achieved. It is a source of information available to those involved in the development of the Study so that they may gain a holistic view of the requirements of the Study in order to better play their own part in it. The PMP is intended to be a live document which should be updated at intervals throughout the Study as further information becomes available.

1.2. Background

In 2021, Council finalised the Coastal Adaptation Study (CAS). This investigated how people, the natural environment and built assets might be impacted by rising sea levels over coming decades so that Council and other stakeholders, such as State Government and private landowners, can plan for the future.

The CAS incorporated the following key components:

- Review of key coastal processes influencing our coastline
- Inundation and erosion risks based on projected sea level rise (in year 2020 and 2100)
- Identification of public and private assets at risk
- Consideration of viable adaptation pathways
- High level recommendations for short and longer term actions to support the recommended adaptation pathways

The CAS outlined the following for Horseshoe Bay:

- Currently, the mid-section of the Bay is impacted by coastal erosion resulting in an almost vertical embankment fronting the recreation reserve.

- In the next 20-30 years, most of the Bay is projected to be directly impacted by waves. The reserve in front of the Port Elliot Surf Life Saving Club is likely to be over-topped by sea water during high water and storm events. As sea levels rise, erosion associated with these high water events is likely to cause the shoreline to move inland.

- By 2100, high water and storm events will have an even greater impact on Horseshoe Bay. Most of the Bay is likely to be directly impacted by waves and it is considered very unlikely that the Bay would be able to retain its existing formation. There will be significant impacts on assets and infrastructure including the café, bowling greens, boardwalk, walking paths and stormwater infrastructure.

Subsequently, the CAS identified Horeshoe Bay at High inherent risk to erosion, with an Extreme risk to erosion by the end of the century without mitigation. More specifically an Extreme risk to public infrastructure.

A key recommendation was for metocean data collection, monitoring, and modelling to be undertaken to better understand the existing processes at play and to understand how the Bay will respond to sea level rise over time.

1.3. Project objectives

A data collection and modelling study is proposed with the following key objectives:

1. Confirm the required setback (erosion buffer) for the medium (2030 - 2050) and longer term (2100).
2. Test viable management options in terms of effectiveness.
3. Assess the economic, social, environmental trade-offs of viable management options and present for consideration to key stakeholders and the community.

1.4. Study stages

To allow for planning and resourcing the project has been categorised into five stages:

1. Inception, data collation and review
2. Establish baseline model and hazard mapping
3. Options assessment
4. Community and stakeholder engagement
5. Reporting

These project stages are highlighted in the following Table 1 and discussed in detail in the following Sections 2.

Table 1: Project Stages

Sequence	Phase	Description

Stage 1	**Inception, data collation and review**	• Project inception with Council and DEW CMB
		• Collection of metocean data:
		  ○ Summer and winter directional wave data
		  ○ Bathymetry survey
		  ○ Pre and post storm survey (via drone)
		  ○ Feature survey (breakwater)

Stage 2	**Establish baseline model and hazard mapping**	• Develop and calibrate wave model • Develop and calibrate longshore, cross-shore and shoreline evolution models • Develop erosion buffer extents (2030, 2050,2100)
Stage 3	**Options assessment**	• Screen viable management options • Scenario test viable options in the calibrated numerical models • Prepare costings per management options and assess environmental and social trade offs
Stage 4	**Community and stakeholder engagement**	• Develop engagement strategy • 2 Workshops with the community and key stakeholders • Supporting engagement material for the Workshops: fact sheets, online survey, text for publicity • Direct engagement with identified focus groups
Stage 5	**Reporting**	• Develop draft report • Community consultation response • Finalise report • Prepare executive summary document • Present to elected members

2 Proposed Method

2.1. Stage 1 - Inception, data collection and review

An inception meeting will be held with Council and representation from Department of Environment and Water, Coastal Management Branch (DEW CMB) to discuss key issues, the proposed methodology and timeline for undertaking the study. A site inspection will be undertaken at the time of the inception meeting by a principal coastal engineer, and sediment samples collected from the nearshore environment.

The data collection campaign has been designed through consultation with Flinders University with the following objectives:

1) Improve understanding of existing coastal process at play

2) Provide data source to validate the numerical models developed in Stage 2

The data collection campaign includes the following:

Deployment of directional wave instrument (3 months over summer, 3 months over winter)
The directional wave data will be collected using our Nortek Signature 1000 ADCP (Acoustic Doppler Current Profiler). The equipment provides directional wave data information, water levels and a vertical profile of current speed and direction. The instrument will be deployed at a pre-approved location using trained technical staff and a vessel.

Bathymetric data for the complete extent of Horseshoe Bay
The bathymetry will be measured using a CEESCOPE echosounder (a state-of-the-art, high resolution portable single beam hydrographic surveying system) mounted upon a jet-ski Positional data will be acquired with a real-time kinematic (RTK). Individual point data to be collected at rate of 1 point per second along profiles spread 25-30m apart. Survey points to be collected in Geocentric Datum of Australia 2020 (GDA2020) with outputs generated in Australian Height Datum (AHD).

Beach topographic monitoring (1 x pre and 1 x post storm event)
Beach topographic monitoring via drone-based photogrammetry, with a pre-specified flight path to measure the change post storm events. Measurements will be taken of the beach/dune from the low tide waterline to the back of foredune/dunefield. A dataset with 2 - 3 cm resolution (horizontal) and 4-6 cm (vertical) is proposed.

Survey of the breakwater
The breakwater will be surveyed for positioning and elevation above Australian Height Datum (AHD), using the drone equipment outlined above.

The data collection campaign will be summarised in a standalone technical report to be provided as an appendix to the main report.

2.2. Stage 2 – Establish baseline model and hazard mapping

The proposed numerical modelling has been developed to:

3) undertake numerical modelling to predict future shoreline erosion and help to inform setback buffers.

4) test different management scenarios and their relative impact on future shoreline erosion.

The following steps are required for developing the baseline numerical models:

Spectral Wave Modelling

A spectral wave model will be setup which includes sufficient resolution in Horseshoe Bay to test the various management options (which would influence wave conditions). The model would be driven using the measured wave data from the Cape de Couedic waverider buoy and include local wind conditions.

The spectral wave model will be calibrated using the wave data collected in Stage 1 to demonstrate that it is able to represent the wave processes between the offshore and the nearshore. Separate model calibration and validation periods will be selected with different wave condition to demonstrate that the model is able to represent the different conditions which occur through the year.

Longshore, Cross-shore and Shoreline Evolution Modelling

To understand the relative importance of longshore and cross-shore sediment transport in terms of shoreline erosion both longshore and cross-shore transport models will be required. A series of profiles perpendicular to the shoreline will be setup to allow the longshore and cross-shore sediment transport to be calculated. The cross-shore model will also simulate the changes in cross-shore profile over time.

In addition, a shoreline evolution model will also be setup to represent the long term shoreline evolution resulting from net longshore transport in the Bay.

Historical cross-shore beach profile for the Bay and the pre/post photograpary survey (captured in Stage 1) will be used to calibrate the models. The models will be setup to simulate a period when shoreline erosion and/or changes in cross-shore beach profile shape occurred and calibrated to ensure that the models are able to provide a good representation of the changes.

The modelling and hazard mapping will be captured in a stand alone technical report to be provided as an appendix to the main report.

2.3. Stage 3 – Options assessment

This stage of the work requires the following key steps:

- First pass screening of viable management options

- Scenario testing of viable management options in the calibrated numerical models (comparing relative effectiveness to reduce coastal erosion impacts).

  The suite of models will be setup to represent the existing (base) case as well as the various management options being considered. The models will then be setup to simulate waves for the existing conditions (base case) and various scenarios over multiple years to inform the longshore/cross-shore transport and shoreline evolution modelling.

  Results from the modelling will be analysed and processed to predict how the management options influence the future shoreline evolution and based on that how any setback buffers would differ between the options.

- Prepare costings (both capital and ongoing operational) to inform further assessment of the options in a Multi Criteria Analysis (MCA).

- Using an MCA framework, assess the benefits and constraints of all viable options, specifically the social, environmental and economic trade-offs.

2.4. Stage 4 - Community and Stakeholder Engagement

This stage of the works is considered integral to the success of the project. It's important to note that whilst this is listed as Stage 4, engagement tasks will be early and ongoing through the course of the project, as shown in the project Schedule (Appendix B).

Key project engagement tasks and the stage these will be executed are outlined below:

- Preparation of an engagement strategy, the strategy will guide engagement for the project to support participation and planning outcomes (Stage 1)

- A two phased approach to engagement:

    - **Phase 1 –** confirm values, present baseline modelling, erosion mapping and assets at risk. To be completed after stage 2 (modelling) and prior to stage 3 (options assessment).

    - **Phase 2 -** present viable options and trade-offs (environmental, social, economic). To be completed after stage 3 (options assessment).

- Engagement support for the two phases of engagement would include:

    - Text for publicity of the Study and proposed workshops for Councils website

    - Focus Group sessions with Ratalang Basham Beach and Horseshoe Bay Advisory Committee

    - Engagement sessions with council staff

    - Engagement sessions with Ngarrindjeri Nations

    - Facilitation of community workshops

    - Fact sheets to summaries to outcomes of the workshops

    - Fact sheets and copy to support the findings of the Study

2.5. Stage 5 – Reporting

The key tasks required for this stage of the Study include:

- Development of draft reporting

- Collate Council, key stakeholders and community responses

- Finalise report and provide executive summary document

- Present to elected members in person

3 Monitoring and evaluation

To ensure the success of the Study, the following monitoring and evaluation measures are proposed:

- ***Project reporting***
  The following project quality assurance reporting parameters are proposed:

    - Preparation of Project Method Statements for both the data collection campaign and development of the baseline numerical models so the proposed technical specifications can be reviewed, and approach approved by a qualified coastal engineer.

    - Post processing of metocean data including QA/QC reporting to be provided upon completion of data collection.

    - Stand alone technical notes to be provided at completion of Stage 1 (Data Collection) and Stage 2 (Baseline model and hazard mapping) to allow hold points for review prior to undertaken community engagement.

    - Engagement Strategy to be developed via consultation with Council at Stage 1 (Inception) to be approved by Council prior to any engagement tasks.

- ***Working collaboratively with DEW CBM branch***
  Council intends to work closely with representatives from DEW CBM throughout the proposed Study given their in-house experience with tender evaluation, in house technical knowledge and appreciate for the coastal management issues at Horseshoe Bay. Specific collaboration includes (not limited to):

    - A representative from DEW CMB will be invited to the tender evaluation panel

    - A representative from DEW CMB will be invited to attend all project briefing sessions with the engaged consultant through out each Stage of the works including the two community workshops

    - The draft Project Method Statements prepared for the data collection program and modelling will be provided to DEW CMB for review and comment

    - The draft Report will be provided to DEW CMB for review and comment

- ***Model Calibration***
  The *Spectral Wave Model* and *Longshore, Cross-shore and Shoreline Evolution Model* will be calibrated against real, measured wave and beach elevation data to ensure reliability in their results. Output results will be checked for accuracy by the modelling sub-consultant and final results evaluated by independent engineers.

4 Project resourcing

The project will ultimately be delivered by the engaged consultant however the below project structure outlines how Council will oversee the successful delivery of the project.

- **Project Sponsor:** Mark van der Pennen
  Responsible for the higher level oversight and strategic direction of the project

- **Project Manager:** Monika Rhodes
  Responsible for the coordination and successful delivery of the project

It is not unusual for these roles and responsibilities to change over the duration of the project and it is recommended that they be reviewed at the study inception (Stage 1).

5 Proposed fee

Council has taken the time to work with a Principal Coastal Consultant from Wavelength to establish a realistic fee to deliver the works. The development of the proposed fee involved consultation with a number of specialists to support the Study, including:

- Flinders University - Metocean Data collection (Stage 1)
- Port and Coastal Solutions - Numerical Modelling (Stage 2 and 3)
- URPS - Community Engagement (Stage 4)

A summary of the proposed fee for each stage of the works in presented in Table 2 below. A detailed breakdown of the fee is presented in Appendix A.

Table 2 Summary of cost per study stage

Stages	Total Costs (GST exl.)
Stage 1 - Inception, data collation and review*	$51,330
Stage 2 - Establish baseline model and hazard mapping	$37,020
Stage 3 - Options assessment	$15,400
Stage 4 - Community and Stakeholder Engagement	$25,200
Stage 5 - Reporting	$17,100
Project Management	$3,950
TOTAL (GST ex.)	**$150,000**
GST (10%)	**$15,000**
TOTAL (GST inl.)	**$165,000**

** The Flinders University equipment levy fee (TOTAL $9,125 GST exl.) has not been included in the price on the assumption the data can be used by the University for student projects.*

6 Schedule

Table 3 lists the key project milestones and timeframes per stage. A full project programme is included in Appendix B. The programme should be reviewed and updated at project inception (Stage 1).

Table 3: Project key timing requirements

Project stage	Key milestone and preceding tasks	Timeframes
Stage 1 - Inception, data collation and review	- Wave data collection required over Summer and Winter period.	Month 1 - 11
Stage 2 - Establish baseline model and hazard mapping	- Validation of models requires completion of winter and summer wave instrument deployment periods.	Month 4 - 12
Stage 3 - Options assessment	- Requires outputs from both the calibrated models (Stage 2) and Workshop 1 (Stage 4)	Month 14 – 16
Stage 4 - Community and Stakeholder Engagement	- Workshop 1 cannot be undertaken until findings from Stage 2 captured. - As outlined above outputs from Workshop 1 required for Options Assessment (Stage 3) - Outputs from Stage 3 required for Workshop 2	Inception -Month 1 Workshop 1 Month 12 – 13 Workshop 2 - Month 16 – 17 Reporting – Month 19-20
Stage 5 – Reporting	- Completion of Stage 3 and Workshop 2 (Stage 4) required to commence reporting - 2 weeks has been allowed for community comment - 2 weeks has been allowed for DEW CMB and Council review comments to be incorporated	Month 18 – 20

7 Risk management

A preliminary risk assessment has been undertaken to identify the key project risks and opportunities and is summarised in Table 4 below.

This assessment doesn't include health and safety risks associated with the field works (Stage 1 – data collection), which would be managed via the consultancy agreement.

It is recommended that the risk assessment be revisited at the completion of each project phase.

Table 4: Study risk assessment

Project phase	Risk scenario	Consequence category	Consequence	Likelihood	Risk rating	Required controls
Pre project	A lack of contractors available with required technical experience to tender for works	Quality Schedule	extreme	possible	significant	Adequate time is allowed between tendering and tart date to entice sufficient contractors for a project of this value.
Pre project	Tendered prices received are higher than fee estimate (detailed in Appendix A)	Economic	major	possible	tolerable	
Stage 1	Unable to commence project prior to Nov'22 missing the summer wave data collection period	Schedule	major	unlikely	tolerable	
Stage 1	Technical failure of deployed instruments (wave instrument) unable to use data	Quality Schedule Economic	extreme	possible	significant	The wave instrument provides real time updates linked online, it will be the responsibly of the field technician to monitor and respond if faulty data is presented. This may require retrieving, servicing, and redeploying the instrument.
Stage 2	Various numerical models developed are not fit for purpose to scenario test the management options identified in Stage 3 and Stage 4	Quality Schedule Economic	major	possible	tolerable	
Stage 3	First pass screening identifies no viable options to pursue	Quality	major	unlikely	tolerable	
Stage 3	Costings prepared for each management option are beyond what Council are able to afford/consider	Economic Reputation	major	unlikely	tolerable	
Stage 4	Community or stakeholder opposition to proposed viable management options	Reputation Schedule	major	likely	significant	Proactive stakeholder engagement plan including early and ongoing engagement with key stakeholders, focus groups and broader community
Stage 4	Unable to generate broader community interest in the Study, input from the community is low	Quality Reputation	moderate	possible	tolerable	
Stage 4	Resurgence in COVID-19 causes future lockdowns. Increase project delays or quality of engagement.	Quality Schedule	major	possible	tolerable	
Stage 5	Lack of key stakeholder and or community buy in for the Study outputs	Reputation	major	possible	tolerable	

Appendix A – Detailed cost breakdown

Stages and tasks	TOTAL COST
Stage 1 - Inception, data collation and review	
Inception meeting with Council, DEW and site visit	$1,580
Preperation of work method statement	$800
Data Collection (Flinders University):	$3,300
Beach Topographic monitoring	$8,100
Breakwater survey	$1,940
Wave Data Collection	$17,120
Bathymetry	$13,710
Infrastrucure Levy (25%) (included in data can not be shared with the university)	*$9,125*
Technical note - data collecton	$4,780
SUB TOTAL	**$51,330**
Stage 2 - Establish baseline model and hazard mapping	
Preperation of work method statement	$720
Numerical Modelling Development (Ports and Coastal Solutions):	
- Spectral wave model (model setup, calibration and validation)	$9,160
-Longshore, Cross-shore and Shoreline Evolution Modelling (model setup, calibration and validation)	$16,860
Technical note - model development and hazard mapping	$10,280
SUB TOTAL	**$37,020**
Stage 3 - Options assessment	
First pass screening of viable options	$1,280
Scenarion testing of viable options in calibrated models (Ports and Coastal Solutions)	$10,840
Preparing costings for viable options	$1,640
MCA of vaible options	$1,640
SUB TOTAL	**$15,400**
Stage 4 - Community and Stakeholder Engagement (URPS)	
Prepare engagement strategy	$1,350
Engagement support (text for publicity for workshops 1 and 2)	$850
Engagement with Ratalang Basham Beach and Horseshoe Bay Advisory Committee and (stage 1)	$1,600
Engagement with council staff (assume same day as RBBABAC meeting above)	$1,600
Engagement with Ngarrindjeri Nation (stage 1)	$2,000
Community workshop 1 - confirm values, present Baseline Modelling, Erosion Buffers an Assetas at risk, start discussion of options (prepare, travel, facilitate and write up workshop)	$4,100
Online survey - values and preferences (survey preparation and analysis)	$1,200
Engagement with Ratalang Basham Beach and Horseshoe Bay Advisory Committee (stage 2)	$1,100
Engagement with council staff (assume same day as RBBABAC meeting above)	$1,600
Engagement with Ngarrindjeri Nation (stage 2)	$2,000
Community workshop 2 - present viable options and trade offs (prepare, travel, facilitate and write up workshop)	$4,100
Fact sheets to support engagement on draft strategy	$1,200
Close the loop messaging	$500
Prepare engagement report	$2,000
SUB TOTAL	**$25,200**
Stage 5 - Reporting	
Develop draft reporting	$13,080
Finalise report	$1,280
Community consultation responses	$360
Preapre executive summary document	$930
Present to elected members in person	$1,450
SUB TOTAL	**$17,100**
Project Management	
Administration, project management	$3,950
SUB TOTAL	**$3,950**
TOTAL (GST ex.)	**$150,000**
GST (10%)	**$15,000**
TOTAL (GST inl.)	**$165,000**

Appendix B – Proposed schedule

Task	Months																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Nov '22	Dec '22	Jan '23	Feb '23	Mar '23	Apr '23	May '23	June '23	July '23	Aug '23	Sep '23	Oct '23	Nov '23	Dec '23	Jan '24	Feb '24	Mar '24	Apr '24	May '24	June '24
Stage 1 – Inception and Data Collation																				
Inception meeting and site visit																				
Data collation and review																				
Wave buoy summer deployment																				
Prepare interim tech note																				
Wave buoy winter deployment																				
Finalise tech note																				
Stage 2 - Establish baseline model and hazard mapping																				
Spectral wave model																				
Longshore, Cross-shore and Shoreline Evolution																				
Finalise model calibration																				
Technical note - model development and hazard																				
Stage 3 – Options Assessment																				
First pass screening of viable options																				
Scenario testing of viable options in calibrated models																				
Preparing costings for viable options																				
MCA of viable options																				
Stage 4 – Community Engagement																				
Prepare Community Engagement Plan																				
1: Values Engagement																				
Preparation of materials inc. factsheet																				
1 x workshop with community and stakeholders																				
1 x online community survey and analysis of results																				
Prepare unique engagement summary report																				
2: Adaptation Options Engagement																				
Preparation of materials inc. factsheet																				
1 x workshop with community and stakeholders																				
1 x online community survey and analysis of results																				
Prepare unique engagement summary report																				
Stage 5 - Reporting and Presentation																				
Develop draft reporting																				
Community consultation responses																				
Finalise report																				
Preapre executive summary document																				
Present to elected members in person																				