

Princess Royal Harbour CHRMAP

Risk Evaluation and Treatment

City of Albany

28 June 2023





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EXECUTIVE SUMMARY

The Western Australian Government Western Australian Planning Commission's "State Planning Policy No. 2.6: State Coastal Planning Policy" (WAPC, 2013, herein referred to as "SPP2.6") addresses climate change, sea level rise, increased coastal inundation and coastal erosion. SPP2.6 recommends that management authorities develop a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) for land use or development vulnerable to coastal hazards. Specific CHRMAP Guidelines have been developed to assist this process (WAPC, 2019).

The Princess Royal Harbour region has been identified as potentially exposed to inundation hazard. Additionally, Little Grove (located within Princess Royal Harbour) is on the watchlist for coastal erosion (Seashore Engineering, 2019). This coastal hazard risk is a key trigger for the requirement of this CHRMAP. Therefore, the present study aims to investigate and plan for coastal hazards likely to affect Princess Royal Harbour. Figure 1-1 shows the study area. The study area is a semi-enclosed natural harbour in Albany on the south coast of Western Australia. The Harbour is approximately 4 km wide and 8 km long, with an approximate area of 28 km² within the City of Albany. The Harbour contains subtidal seagrass meadows and the working Port of Albany. The Port of Albany is a significant exporter for the state.

This CHRMAP increases knowledge and understanding of coastal hazard risks and identifies risk management and adaptation measures for implementation. The outcomes will be used to inform local government policies, strategies and plans, including (but not limited to), planning strategies, community strategic plans, drainage strategies, asset management plans, emergency management plans, and foreshore management plans. The project will adhere to the WAPC (2019) guidelines with scope and deliverables to be consistent with their objectives and SPP2.6. In addition, the project will identify the strategic direction for coastal adaptation scenarios from the present to 2122 (100-year management time frame) and determine an implementation plan to achieve this direction. Overall, this CHRMAP will develop a flexible adaptation pathway for the region and serve as a key reference for management, planning and policymaking for the short-term (0-25 years), medium-term (25-50 years), and long-term (100 years).

This report presents the Stage 4 – Risk Evaluation and Treatment Options Chapter Report, which identifies priority areas for treatment, a suite of available adaptation options and assessment of treatment options using multi-criteria analysis. The red bubble in Figure 1-2, indicates where this component sits within the CHRMAP process diagram.

The risk evaluation and treatment analysis arising out of this report and summarised in Table 5-2. A number of viable options have been identified for all Management Units with a prevalence of "Avoid", "Planned / Managed Retreat" and "Accommodate" options.

Following a meeting of the Community And Business Reference Group (CBRG) and two community engagement sessions, this report has been updated to incorporate key feedback. An engagement summary is provided at Appendix B. The next CHRMAP chapter report will present the cost benefit analysis of the positively scored adaptation options identified herein.



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1 INTRODUCTION

It is internationally recognised that the mean sea level has been rising globally since the nineteenth century and is projected to rise at an increasing rate in the future (IPCC 2021). Rising sea levels and intensifying storm activity will increase the risk of coastal inundation (temporary or permanent), storm erosion and long-term shoreline recession. State governments across Australia have introduced obligations that require local governments to consider and plan for these hazards. In Western Australia (WA), the governing policy is the Western Australian Planning Commission's (WAPC) State Planning Policy No. 2.6: State Coastal Planning Policy (WAPC, 2013, herein referred to as "SPP2.6"). SPP2.6 recommends that management authorities develop a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) for land use or development potentially vulnerable to coastal hazards. Specific guidelines have been developed to assist this process (WAPC, 2019).

SPP2.6 requires adequate risk management planning where existing or proposed development is in an area at risk of being affected by coastal hazards over the 100-year planning timeframe. SPP2.6 and the CHRMAP Guidelines provide the risk assessment framework to be applied to identify risks intolerable to the community and other stakeholders such as local governments, indigenous and cultural interests, and private enterprises. Risk management measures are then developed according to the adaptation hierarchy outlined in SPP2.6.

The study area for this CHRMAP is the entire shoreline within Princess Royal Harbour, Albany, within the City of Albany local government area (refer Figure 1-1). It consists of various shoreline types and many coastal assets, involving multiple stakeholders:

- Port and breakwaters protected by physical controls
- Roads along the shoreline protected by physical controls
- Shallow sandy foreshore backed by vegetation
- River mouths and channels through the sandbars
- Sailing club, boat ramp and other coastal infrastructure
- Presence of rock features

This CHRMAP project aims to increase knowledge and understanding of coastal hazard risks and identify risk management and adaptation measures for implementation. The outcomes will be used to inform local and state government policies, strategies and plans, including (but not limited to), planning strategies, community strategic plans, drainage strategies, asset management plans, emergency management plans, and foreshore management plans. The project will adhere to the WAPC (2019) guidelines with scope and deliverables to be consistent with their objectives and SPP2.6. In addition, the project will determine the strategic direction for coastal adaptation scenarios from the present-day to 2122 (100-year management time frame) and identify an implementation plan to achieve this direction. Overall, this CHRMAP will develop a flexible adaptation pathway for the region and serve as a key reference for management, planning and policymaking for the short-term (0-25 years), medium-term (25-50 years), and long-term (50-100 years).

Delivery of this project will occur over 8 stages (as summarised in Figure 1-2), each representing a key hold point. The staged approach is developed according to the PRH's scope and is in line with the CHRMAP Guidelines (WAPC, 2019).

This draft report presents Stage 4&5: Risk Evaluation & Treatment Options, which identifies risks and presents and assesses treatment options using multi-criteria analysis. The red bubble in Figure 1-2, indicates where this component sits in the CHRMAP methodology. This report will be completed following the CBRG meetings and engagement sessions.



Figure 1-1 Princess Royal Harbour Study Area

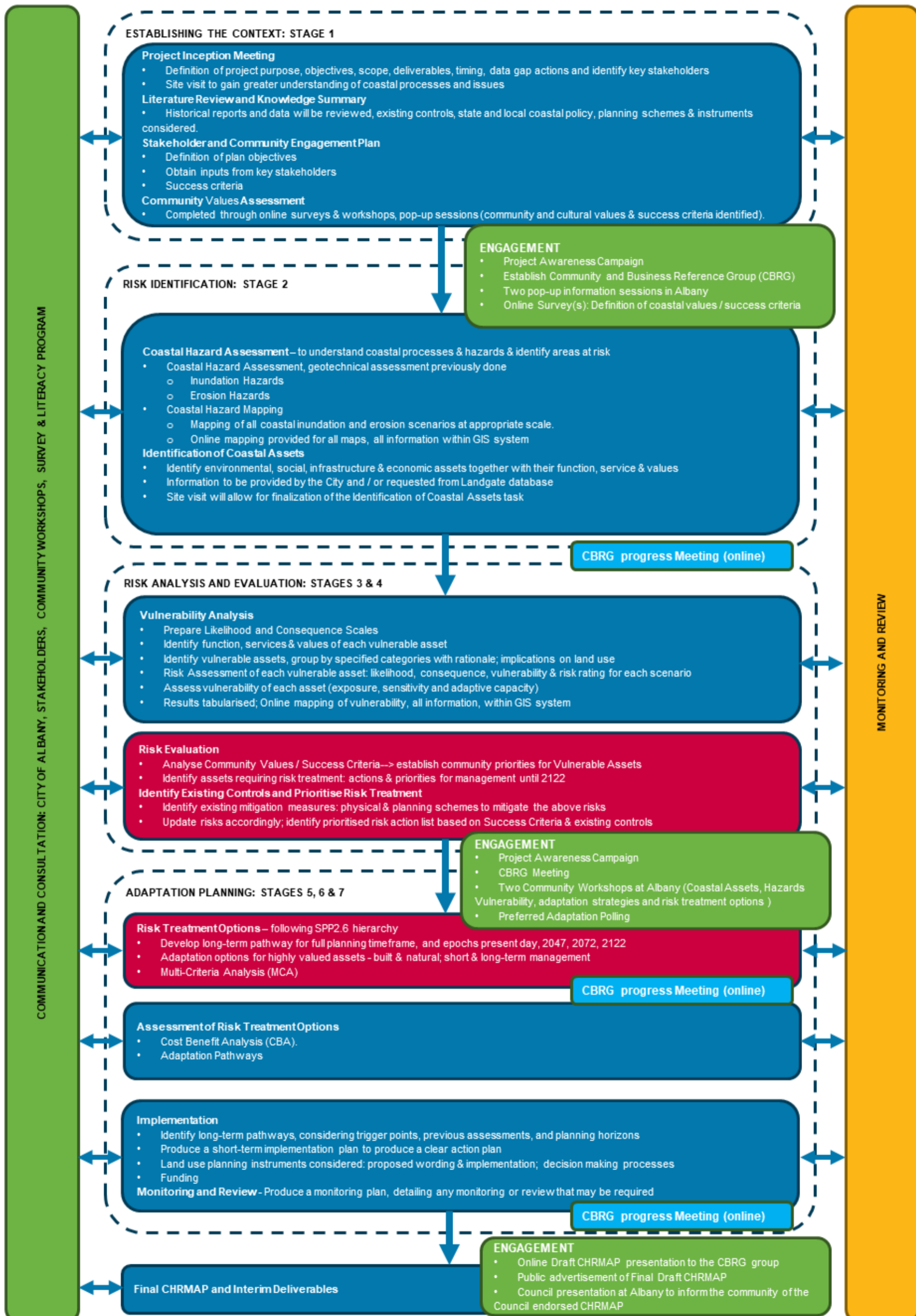


Figure 1-2 Methodology



2 RISK EVALUATION

This section evaluates how coastal hazard control measures could mitigate the vulnerability ratings assigned in the previous chapter report (Water Technology, 2022b). The coastal hazard assessment (Water Technology, 2022a) has already assigned any relevant physical controls.

2.1 Existing Controls

2.1.1 Planning Controls

A summary of relevant planning controls for the study area is provided in Water Technology (2022a). In addition, the study area contains an extensive array of planning documentation, most of which makes mention of coastal hazards or coastal values, which will provide input into the CHRMAP process.

This CHRMAP will consider what planning controls (existing or required) may be appropriate as adaptation measures within each management unit.

2.1.2 Physical Controls

The existing physical controls in the study area are reported in Water Technology (2022a) and include coastal protection structures such as seawalls, rock protection, and sheet-piled wharf. Where appropriate, these have already been considered in the hazard and vulnerability assessment (2022b). and the vulnerability ratings from the report include these structures.

2.2 Priorities for Treatment

Table 2-1 and Table 2-2 summarises the average erosion and inundation vulnerability ratings for each Management Unit (MU) and planning horizon using the result of the vulnerability assessment (2022b).

All MUs at all planning horizons have "high" and "extreme" erosion and inundation vulnerability ratings for one or more asset categories, except MU5 – inundation, which has only "medium" vulnerability ratings. The erosion is a more imminent threat than inundation across the MUs and planning horizons.

A vulnerability rating above "medium" require risk management (WAPC). WAPC defines high and extreme risk as "intolerable". This report proposes and assesses various options to address these vulnerabilities.

Table 2-1 Erosion vulnerability ratings by management unit & planning horizon

Management Unit	2022	2037	2052	2122
MU1-Point King to Melville point	High	High	High	Extreme
MU2 - Melville Point to Rushy Point	High	High	Extreme	Extreme
MU3 - Rushy Point to Limekilns Point	High	Extreme	Extreme	Extreme
MU4 - Limekilns Point to Geake Point	High	High	High	Extreme
MU5 - Geake Point to Possession Point	High	High	Extreme	Extreme



Table 2-2 Inundation vulnerability ratings by management unit & planning horizon

Management Unit	2022	2037	2052	2122
MU1-Point King to Melville point	Medium	Medium	Medium	High
MU2 - Melville Point to Rushy Point	Medium	Medium	Medium	High
MU3 - Rushy Point to Limekilns Point	Medium	Medium	Medium	High
MU4 - Limekilns Point to Geake Point	Medium	Medium	Medium	High
MU5 - Geake Point to Possession Point	Medium	Medium	Medium	Medium



3 RISK TREATMENT APPROACH

3.1 Risk Management and Adaptation Hierarchy

SPP2.6 provides a hierarchy of adaptation pathways to guide decision-making in coastal areas. This hierarchy should be used by planning authorities and development proponents when considering adaptation pathways to minimise coastal hazard risks at the local level.

The hierarchy, presented in Figure 3-1, indicates a clear preference for the pathway “avoid” over “protect”. This preference is emphasised in SPP2.6, the policy guidelines, the CHRMAP Guidelines and the WA Coastal Zone Strategy.

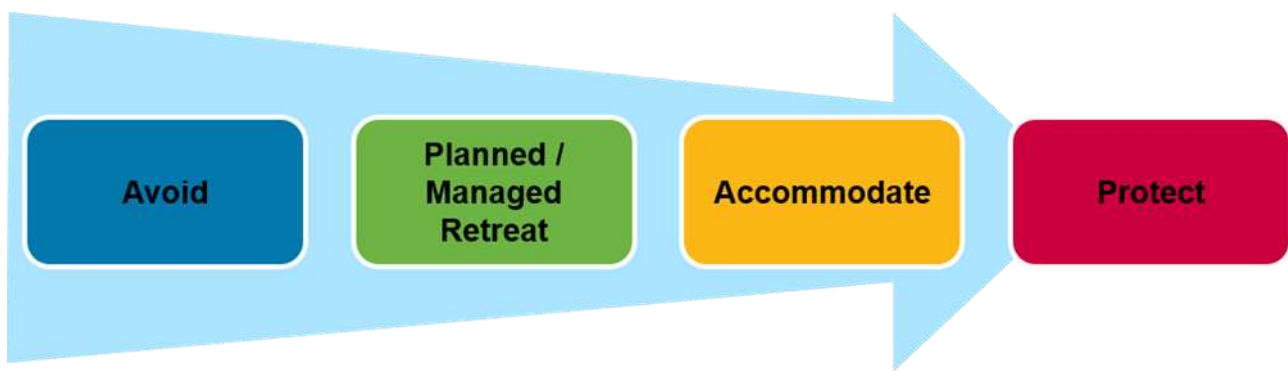


Figure 3-1 Coastal hazard risk management and adaptation planning hierarchy (adapted from WAPC, 2019)

3.2 Avoid

The “avoid” pathway aims not to install new public and private assets within areas affected by coastal hazards. The “avoid” pathway can manage coastal erosion and inundation hazards.

Sometimes this is unavoidable when assets are necessary in the coastal hazard zone. However, a screening question to assist in making such a decision would be: “Does this asset need to be close to the coast to perform its primary function?”. Most assets will benefit from being located near the coast. However, few assets have a primary function genuinely related to the coast.

The lifetime (design life) of a new coastal asset is a key consideration in locating new assets near coastal hazard areas. For instance, the construction of picnic facilities or public toilets should be avoided if coastal hazards are likely to impact these assets within their projected lifetime.

Similarly, the construction of new private assets likely affected by coastal hazards over their projected lifetimes should not be allowed.

3.3 Planned or Managed Retreat

The “planned or managed retreat” pathway aims to relocate or remove assets located in hazard zones in an orderly manner, where hazard risks are likely to become intolerable over relevant planning timeframes. In recognition of the increased risk to assets in the coastal zone, the DPLH and the Western Australian Planning Commission provide guidance on implementing a planned or managed retreat policy through property



acquisitions (WAPC, 2019). “Planned or managed retreat” can manage coastal erosion and inundation hazards.

Planned or managed Retreat is mostly applicable to developed areas, where there is less potential to adapt to coastal hazards through development planning controls, such as setbacks in Greenfield areas. The retreat strategy supports social, environmental and economic sustainability and ties into the SPP2.6 objectives and adaptation hierarchy. It allows for continuing public access to beaches, beach amenity, and the provision of a coastal foreshore reserve.

The CHRMAP Guidelines (WAPC, 2019) suggest various mechanisms for “managed retreat” in developed areas, using compulsory or voluntary acquisition provisions outlined in state legislation. Land swaps and/or leaseback of private property are also possible alternatives to acquisition. These alternatives can reduce overall implementation costs and remove people and assets “out of harm’s way”.

The main challenge of “managed retreat” is the significant political capital and investment necessary to fund acquisitions. A considerable funding contribution may need to be gathered from the State or Commonwealth to implement managed Retreat at large scale. In the meantime, pilot projects could be considered to demonstrate the benefits associated with this pathway.

Economically, relocation or managed retreat options may be triggered by the physical costs of repair exceeding the relocation costs. As per the success criteria and adaptation hierarchy, consideration should be given to the continued allowance for a recreational reserve. This may mean relocating buildings ahead of their risk rating to continue allowing this space.

At the time of writing, “managed retreat” has not been implemented to manage coastal hazards in WA. Therefore, landholders and the broader public should be aware of the risks in decisions related to valuing, purchasing or developing lands in coastal hazard zones.

3.4 Accommodate

The “accommodate” pathway controls the coastal hazards with design and management strategies. Accommodate can minimise coastal inundation and erosion hazards effectively but is primarily suited to adapting to inundation risk. For example, to minimise inundation risks, design and management strategies can include minimum finished floor levels (FFLs) or elevated electrical circuitry. Erosion hazards may be accommodated via deep foundations or relocatable buildings, which can be subject to a “planned retreat” pathway when at high risk. In this way, the ‘Accommodate’ pathway allows landholders to use assets until hazards become intolerable while mitigating existing coastal hazards and potential legal and financial liabilities.

It should be noted that the current State legislative framework means that permanently inundated private land does not become Crown land, unlike in other Australian states (Robb et al 2017, Robb et al 2018). Therefore, if the shoreline is allowed to recede beyond private property boundaries, public access and trespass issues may arise. This should be a key consideration when assessing the appropriateness of this pathway.

3.5 Protect

The “protect” pathway stabilises shoreline using hard or soft coastal protection works such as seawalls, groynes, offshore breakwaters, geotextile sand-containers, sand renourishment and levee banks. Protection is a pathway that can be applied to manage coastal erosion and inundation hazards.

The adaptation hierarchy considers the construction of new protection measures as the least preferred pathway of all potential pathways listed in the hierarchy. This is because protection measures, particularly hard measures such as rock groynes and seawalls, interfere with local coastal processes and can have detrimental effects on local ecological systems. Protection measures can also inflate property values in hazard areas, creating expectations that protection measures can be maintained indefinitely. Adopting this pathway early will



limit the capacity of future decision-makers to adopt another pathway as climate change progresses. This is particularly important beyond 2100 as sea level rise is very unlikely to abate in the 22nd century (IPCC, AR6).

Over the short to medium term, public authorities may need to consider interim protection measures to delay shoreline recession. Interim measures such as coastal dunes revegetation and beach nourishment can effectively mitigate coastal hazards.

Where public and private assets are proposed inland of interim protection measures, the design life of the protection measure should be a determining factor in assessing the appropriateness of the proposed development.

3.6 No Regrets

“No regrets” pathway improves coastal hazard resilience and preparedness at a low cost and in a flexible manner. These can be undertaken simultaneously with investigations necessary to implement a thorough risk treatment pathway.

Coastal monitoring is a “no regret pathway” that improves the understanding of coastal hazards, risks and vulnerabilities and the effective life of existing coastal structures.

Similarly, modifying planning frameworks and providing clear direction for planning authorities when assessing applications for new development and affected landholders is a “no regret” pathway. However, the political capital necessary to make such planning changes can be high. Therefore, modifying planning frameworks should be done opportunistically and sensitively. Planning frameworks might introduce or modify the following instruments:

- Special Control Areas (SCA), to ensure planning discretion over new development
- Clear development assessment criteria, to ensure that new development gives due regard to coastal hazards
- Notifications on title, to inform current and future property owners at risk
- Time or event-limited planning permits to allow the continued use of land until hazards become intolerable
- Requirements for emergency evacuation plans (also relevant to Accommodate pathways)

3.7 Do Nothing

The do-nothing pathway assumes that no action will be taken, and that all levels of existing risks are accepted.

This pathway can be useful for comparisons with other pathways but is considered unacceptable because it will increase risk to people and properties. Developed foreshores require public safety management and basic public services.

3.8 Hierarchy Summary

Maintaining public access to the coast in developed areas is one of the main objectives of SPP2.6.

The current State legislative framework means that where the shoreline recedes beyond private property boundaries, public access and trespass issues are likely to arise. This situation implies that public authorities have two main adaptation pathways available to them for preserving public coastal access:

- **Planned or Managed Retreat** i.e., maintaining a foreshore reserve through the public acquisition of private property; or,
- **Protect** i.e., preventing the shoreline from receding beyond private property boundaries by stabilising the current shoreline position using various protection measures



Where public authorities cannot commit to either of these pathways over the long term, they may **Accommodate** and modify local planning frameworks to manage new development so that they are appropriately designed and located. Public authorities in this situation may also consider the appropriateness of interim Protection measures to preserve public interests by delaying shoreline recession and minimising the effect of regular nuisance inundation events on existing development and infrastructure.

The coastal hazard assessment has provided an indicative timeframe for when adaptation will be required. However, it is recommended to use triggers for adaptation, including relocation or managed retreat purposes in line with WAPC (2019):

- Where the most landward part of the Horizontal Shoreline Datum (HSD) is within 40 metres or S1 of the most seaward point of a development / structure / foreshore reserve area.
- Where a public road is no longer available or able to provide legal access to the property
- When water, sewage or electricity to the lot is no longer available as they have been removed / decommissioned by the relevant authority due to coastal hazards.

3.9 Success Criteria

The success criteria for the study identified in the Water Technology (2022b) Report are presented in Table 3-1. These criteria demonstrate that the stakeholder and community values in the study area reflect the requirements of the state, regional and local planning controls. The success criteria highlight the need to maintain the natural environment, ensure that future developments do not accelerate erosion or inundation, manage land at risk, and manage recreational assets. They also identified maintaining a healthy harbour environment.

Table 3-1 Success criteria

- Ensure future land use and development do not accelerate coastal erosion or inundation risks or have a detrimental impact on the functions of public reserves.
- Manage land at risk of coastal erosion and inundation to avoid inappropriate land use and development.
- Maintain the Harbour for environmental health, including flora and fauna habitat.
- Conserve, enhance and maintain the natural environment and character of the study area
- Sustain the ability for the current and future generations to recreate along the Harbour.
- Protect and or manage appropriately the provision of recreational assets in the coastal zone
- Maintain safety for all.
- Retain the widest possible range of risk management options for future users of the coast

3.10 Summary for Decision Makers

Table 3-2 presents a summary of the relevant information for adaptation. The CHRMAP process aims to minimise coastal hazards and maximise the beneficial use of the coast.



Table 3-2 Adaptation consideration summary

- Adaptation options should minimise coastal process interference and legacy issues
 - The adaptation hierarchy is presented in **Figure 3-1**
- Coastal development must be sustainable in the long term and must balance the community, economic, environmental and cultural needs
- Local Governments are responsible for managing risks to **public assets** and any assets they manage. They should also:
 - Develop local policies and regulations consistent with state legislation and policy
 - Facilitate building resilience and adaptive capacity within the local community
 - Work in partnership with the community to identify and manage risks/impacts
- Management strategies that preserve the natural coastline and move development away from the active coastal zone in an orderly manner are considered ideal. Of particular relevance to the CHRMAP process is the user-pays principle, whereby those who benefit most from protection must provide the greatest financial contribution
- Adaptation options should maintain future flexibility to build resilient coastal communities
- A key adaptation option will be the use of planning instruments, including managed Retreat.

No law requires public authorities to protect private property from natural hazards nor compensation when land is lost due to coastal hazards.



4 RISK TREATMENT OPTIONS

4.1 General Options

Table 4-1 below lists available adaptation options suitable for most coastal sites. These adaptation options relate to both short-term and long-term adaptation to coastal hazards, not just in relation to planning for climate change impacts. The column on the right-hand side discusses the application potential for the study area.

The option categories of Avoid, Planned or Managed Retreat, No Regrets and Do Nothing all apply generally to adapting to both erosion and inundation hazards. Accommodate applies primarily to inundation. Most Protection options apply primarily to erosion with PR6 (Levee / Weir / Storm Surge Barrier) applicable to inundation.

Any new assets should avoid the hazard zone. If they must be located within the hazard zone, they should be designed to withstand the inundation hazard. For example, new buildings to be constructed with permeable lower levels (e.g., a stilt or deep pile foundation arrangement designed for coastal exposure, including wave actions) and services above the flood level. This avoids the need to use fill to raise the FFL. Fill is expensive and alters overland flow, which could lead to increased hazards elsewhere, leading to legal challenges.

Whilst the risks and their corresponding adaptation options are assessed separately, triggers to adapt can occur at any time from either erosion or inundation.

4.2 Planning Control Options

This section outlines the key planning instruments which should be considered for incorporation into the City's local planning frameworks. These instruments are beneficial for implementing the "Accommodate" and "Planned or Managed Retreat" pathways.

4.2.1 Special Control Area

The local planning scheme can be amended to introduce a Special Control Area (SCA) over all land identified as being at risk of coastal erosion and/or inundation. The SCA would be delimited by the position of either the 2122 coastal processes setback line or the inundation extent of the 500-year ARI event in the year 2122, whichever is the more landward.

An SCA could cover erosion or inundation separately or both, as presented above. An SCA is an overlay that applies in addition to the underlying classification of the land and identifies planning controls that apply in addition to any other requirements relevant to the underlying zone. Development that might otherwise be exempt from development approval would then be required to obtain a planning approval in addition to a building approval. An SCA can facilitate land use changes and development control within that area.

An SCA should be applied to relate specifically to land subject to coastal hazards (as recommended in WAPC, 2019).

Each SCA is allocated a number and depicted on the Scheme Map.

WAPC (2019) provides a draft amendment text including the purpose, objectives and provisions (see below). The purpose of the SCA is to provide guidance as to the appropriate scope of land use and development to be permitted within a coastal erosion and inundation hazard area. Its objectives would be:

- a. To ensure land in the coastal zone is continuously provided for coastal foreshore management, public access, recreation and conservation.
- b. To ensure public safety and reduce risk associated with coastal erosion and inundation.
- c. To avoid inappropriate land use and development of land at risk from coastal erosion and inundation.



- d. To ensure land use and development does not accelerate coastal erosion or inundation risks; or have a detrimental impact on the functions of public reserves.
- e. To ensure that development addresses the PRH CHRMAP prepared in accordance with SPP 2.6.

The SCA would include additional provisions (over and above or overriding provisions for development not within the SCA), such as:

- a. All proposed development within the SCA requires approval. (This would include development that would not ordinarily require development approval under the scheme).
- b. Approval to be issued on a temporary or time-limited basis. (The applicant could later apply for a further approval, which could be granted if the risk from coastal processes was still considered acceptable).
- c. Referral of applications. (Any planning application should be referred to the Department of Transport, the Western Australian Planning Commission and any other relevant authority for advice and comment on the coastal risk.)
- d. Minimum finished floor levels and/or other development standards.

4.2.2 Coastal / Waterway Local Planning Policy

A local planning policy (LPP) could be prepared / updated to clarify the City's attitude and expectations in relation to coastal development within an identified area, including the type of permanent or temporary assets it is prepared to accept within the coastal reserve and/or on land subject to coastal processes.

LPPs are prepared and adopted according to the provisions in Part 2 Division 2 of the Deemed Provisions of the relevant local planning scheme within each LGA. LGAs may prepare an LPP in respect of any matter related to the planning and development of the Scheme area. The LPP may apply to a particular class or classes of matter specified in the policy and may apply to the whole scheme area or parts specified in the policy.

An LPP can provide more detail and guidance on what sort of development would be acceptable and will also assist the City in making planning decisions on coastal development, requiring the exercise of discretion. For example, on land at risk of erosion within the life of a proposed development the LPP may encourage use of structures that can be disassembled and/or transported when erosion reaches a specified distance of the structure. The policy would also identify the City's intention to require notifications on Title as a condition of development approval. An LPP can outline the City's requirements for building construction, land fill, and other relevant matters within the Special Control Area, noting requirements will be slightly different for erosion and inundation.

4.2.3 Notifications on Title

All freehold land identified as being at risk of impact from coastal processes should have a notification placed on its certificate of title/s to make the owner and future landholders aware of the potential for the land to be impacted.

Section 165 of the Planning and Development Act 2005 enables a local government or public authority to place a notification on the certificate of Title of Land. This aims to make owners and future owners of land aware of being within or proximate to a future coastal hazard that may affect the use and enjoyment of the land, as determined in accordance with SPP2.6 and an endorsed CHRMAP. The process requires the written consent of the landholder and payment of a fee, so it is usual for the requirement for placement of a notification to be a condition of development or subdivision approval. However, placement of a notification on the Title does not have to be tied to an application and could take place at any time with owner consent.



The WAPC in accordance with SPP2.6 recommends the following wording:

This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years from the date this notification is registered.

With regard to the above wording, the WAPC notes that a shorter timeframe than 100 years may be appropriate where identified in an endorsed CHRMAP.

4.2.4 Other Instruments

Other instruments may be useful for implementing adaptation options. These include:

- Restrictive Covenants, which can be used to restrict present and future landholders from constructing protection structures and, to internalise the risk of building in inherently hazardous locations.
- Special Area Rates, which can be used to equitably distribute costs associated with protection options across beneficiaries.
- The requirement for a structure plan could be considered, setting out development provisions and planning controls consistent with SPP2.6 for vulnerable areas with new development/subdivision proposed.
- Update of Local Planning Strategies to inform amendments to other related planning instruments.
- Implementation of LGA internal procedures, to provide a note to settlement agencies when they seek a property report linked to the sale of land (settlement agencies typically request these, and they include details of rates paid, outstanding issues, approved development etc). This would elevate the potential impact to the prospective purchaser, ensuring that later planning controls are not a surprise, mitigating potential claim.

The intent of these instruments aligns with guidance provided in the WA Coastal Zone Strategy, noting that private parties are responsible for managing risks to their private assets and incomes, which might arise from coastal erosion and inundation hazards.



Table 4-1 Risk treatment options from WAPC (2019)

Option Category	Option Name	Option Code	Description of how it will help
Avoid	Locating assets in areas that will not be vulnerable to coastal hazards	AV	Assets will not be vulnerable to risk arising from coastal hazards.
Planned / Managed Retreat	Leaving assets unprotected	PMR1	Accept loss following hazard event. Only implement repairs to maintain public safety. Allow for Retreat that allows natural recession of the shoreline over the long-term.
	Demolition / removal / relocation of asset from inside hazard area	PMR2	Relevant for assets of low value where it is impractical both technically and financially to design the asset to withstand the impact of the coastal hazards instead of relocating it.
	Prevention of further development / prohibit expansion of existing use rights	PMR3	This risk treatment option would enable existing development and use rights to continue without increasing them, until such time that risk arising from coastal hazards is intolerable. Specified in a local planning scheme.
	Voluntary acquisition	PMR4	This risk treatment option would require the acquisition of affected properties, on a voluntary basis.
Accommodate	Design assets to withstand impacts	AC1	Where avoiding or relocating an asset is not an option, design of assets to withstand the impact of inundation.
Protect	Beach nourishment or replenishment (*)	PR1	Placement of sand on the upper beach face and dunes to re-establish the sandy beach and provide a sediment supply.
	Groyne	PR2	Construction of groynes to stop or restrict the movement of sand around the end of the structure, to provide protection to assets behind the beach/foreshore reserve. They are primarily effective where there is longshore sand supply or when partnered with sand nourishment.
	Seawall	PR3	Construction of a seawall usually along an entire section of shoreline. Where a beach is to be retained, this risk treatment option should generally be accompanied with beach nourishment or replenishment.
	Artificial reef	PR4	Construction of a submerged artificial reef offshore, to dissipate wave energy impacting the shore by causing waves to break on their seaward side and reducing wave energy on the leeward side. Artificial reefs do not block waves and during storm events water depths over the reef may be sufficient to allow waves to pass over the reef without breaking, reducing their effectiveness in protecting the beach from erosion.
	Offshore breakwater	PR5	Construction of an emergent offshore barrier (often referred to as an offshore breakwater). Offshore breakwaters effectively block wave energy by absorbing wave impact on their seaward side. They create a lower wave energy section of beach immediately in its lee, which is characterised by a salient where sand accretes in the low energy environment.
	Levee / Weir / Storm Surge Barrier	PR6	Inundation protection to minimise inundation on low-lying land. This could be a Levee on the banks of a river, a storm surge barrier at the entrance to an inlet / estuary and so on. Details would be specific to the relevant conditions of each MU.
No Regrets	Monitoring	NR1	Involves long term baseline monitoring and event-based monitoring following storm erosion events.
	Protection Structure Audit	NR2	Involves undertaking an audit of existing protection structures, to determine their current condition, effectiveness and future protection potential.
	Notification on Title	NR3	Indicates to current and future landowners that an asset is likely to be affected by coastal erosion and/or inundation over the planning timeframe. Helps current and future owners make informed decisions about level of risk they are/may be willing to accept, and that risk management is likely to be required at some stage within the planning timeframe.
	Emergency evacuation plans	NR4	Where existing assets may be affected by inundation and are not already identified in an existing emergency evacuation management plan. Such plans are important in managing the safety of community and stakeholders.
Do Nothing	Do Nothing	DN1	Assumes all levels of risk are accepted and assumes that there is no change in existing planning controls, and no actions are implemented (i.e., no controls are implemented to treat known coastal risks).

(*) Nearshore nourishment may also be considered, where the sand is placed offshore following dredging of offshore sand sources. Nearshore nourishment works with nature and is designed for the coastal processes to move the sand to shore.



5 MULTI-CRITERIA ANALYSIS

Successful risk management and adaptation planning require identifying and diligently assessing suitable risk treatment options to select the best strategy. The selected risk treatment option should mitigate risk to an acceptable level whilst maximising the values important to the stakeholders.

5.1 Assessment Criteria

For this CHRMAP, the key assessment criteria are:

- Effectiveness
 - Ability for the option to mitigate the coastal hazard
- Environmental Impact
 - Impact on existing native vegetation / dunes / coastal processes
 - Includes consideration of:
 - Any construction / clearing impacts
 - Impact of maintenance on the environment
- Social Impact
 - This considers stakeholder and community impacts from previous CHRMAP chapters
 - Potential impacts on Aboriginal and European heritage sites and values are considered in this criterion.
- Aesthetic Impact
 - The visual appeal of the option
 - Consideration of option aesthetics tying into the wider City / Management Unit vision
- Cost
 - Upfront capital costs
 - Ongoing maintenance costs
 - Economic affects – such as loss of businesses, income, value
- Future Adaptability
 - Whether the option is easily adaptable in future, such as for updated sea level rise actuals or projections
 - If the option limits the feasibility of selecting other options in future

Water Technology's coastal management professionals initially assessed the risk treatment options against the criteria. **All ratings are somewhat subjective; however community and stakeholder engagement allowed for additional feedback from the community and further review of the scores attributed – discussed further below..**

Information provided to date by stakeholders was included in the assessment of each value as required. Risk Treatment Options were assessed using the multi-criteria assessment (MCA) matrix shown in Table 5-1, which indicates the rating given to each criterion for a given option and provides the recommendation for pursuing the risk treatment option.



The option categories of Avoid, Planned or Managed Retreat, No Regrets and Do Nothing all apply generally to adapting to both erosion and inundation hazards. Accommodate applies primarily to inundation. Most Protection options apply primarily to erosion with PR6 (Levee / Weir / Storm Surge Barrier) applicable to inundation.

In most cases, it is necessary to implement more than one option, and the options selected through the MCA may vary between management units and with implementation timeframes. The results of the MCA for each Management Unit are summarised in the sections below.

Succeeding the MCA will be a cost-benefit analysis (CBA) of options carried forward from the MCA. This is the subject of the next CHRMAP chapter report. The CBA will allocate an estimated cost to all significant values and detractions of a given option, both at Present and over the option's intended design life, independently from the MCA costs. A net present value (NPV) will be estimated for each risk treatment option. The CBA and MCA will inform a preferred strategy.

5.2 Assessment Framework

Table 5-1 shows the MCA assessment criteria used for each risk treatment option for each Management Unit (MU). The assessment criteria run across the top row whilst the ratings are shown below; each have a possible score from -2 to 2. This methodology is like other MCAs undertaken in Western Australia under the same CHRMAP Guidelines (Cardno, 2017 and Water Technology, 2019).

A professional coastal engineer experienced in risk management assessed the adaptation options ratings. Initial capital and ongoing maintenance costs have been estimated under a single category. The possibility for potential losses is also considered in the cost category. For example, if an option is likely to lead to a drop in land value, that is considered to be a cost to the community and therefore a lower score. The CBA will assess Economic factors in more detail.

Following the preparation of the draft MCA, the results were reviewed by the Steering Committee and the Community And Business Reference Group (CBRG). In addition, community members attended two workshops to provide their thoughts on adaptation options to enable further review and calibration of the MCA scoring. The engagement focussed on the Environmental, Social and Aesthetic Impact categories. The workshops are discussed further in the latest Engagement Outcomes Report (refer Appendix B). Several component category scores changed during this review process, but only the following options changed recommendations:

- MU1 – PMR2 Demolition / removal / relocation of asset from inside hazard area – changed from 'Not Recommended' to 'Recommended', so will still be analysed in the CBA process.
- MU1 – PR3 Seawall – changed from 'Suitability Unclear' to 'Recommended', so will be analysed in the CBA process.
- MU1 – PR4 Artificial Reef– changed from 'Suitability Unclear' to 'Not Recommended', so will not be considered further.
- MU2 - PR3 Seawall – changed from 'Not Recommended' to 'Suitability Unclear', so will be considered in CBA process.
- MU5 – PR2 Groynes, PR3 Seawall, PR4 Artificial Reef and PR5 Offshore Breakwaters – all changed from 'Suitability Unclear' to 'Not Recommended', so will not be considered further.

5.3 Multi-Criteria Analysis Summary

The MCA Analysis for each management unit is provided in Appendix A, with each adaptation option assessed. Table 5-2 summarises the evaluated status of each option for each management unit. Options receiving a positive score are recommended for further consideration. Options receiving a score of zero are included with



positive scoring options to be further analysed and allow a margin for uncertainty in the process. Options receiving a negative score are discounted from further analysis in this project. The next chapter report of this project will take the options identified in the MCA and prepare a cost-benefit analysis (CBA) of them. Separate to the score applied in the MCA for option costs, the CBA will allocate an estimated cost to all significant values and detractions of a given option, both at present and over the option's intended design life, to aid selection of a final strategy.



Table 5-1 Multi-criteria assessment framework

Rating; Score	Effectiveness	Environmental Impact	Social Impact	Aesthetic Impact	Cost (Capital & Ongoing)	Future Adaptability	Final Recommendation
Positive; +2	Expected to be very effective	Significant positive impact; return to more natural coastline	Significant positive social impact; encourages community development	Positive aesthetics, improves existing coastline and place recognition	Low costs. Higher capital costs accepted if other criteria met. Very low economic loss.	Very adaptable, not likely to leave legacy issues	Further Investigation Recommended; Score > 0
Positive; +1	Expected to be effective	Positive impact; return to more natural coastline	Positive social impact; encourages community development	Positive aesthetics, retains the existing coastline and place recognition	Reasonable costs. Higher capital costs accepted if other criteria met. Low economic loss.	Adaptable, not likely to leave legacy issues	Further Investigation Recommended; Score > 0
Neutral; 0	May or may not be effective, possibly unable to predict	No (or unclear) environmental impact	No discernible social impact; indeterminate net impact	Neutral aesthetic	Moderate costs	May leave legacy issues	Suitability unclear; Score = 0
Negative; -1	Likely to be ineffective in the short or long term	Potential significant negative impacts, including losing beaches altogether	Negative social impact. May discourage new or existing people from the area	Coastline / foreshore appearance negatively altered	High initial or ongoing costs, especially if low likelihood of success. High economic loss.	Likely to create legacy issues	Not recommended; Score < 0
Negative; -2	Very likely to be ineffective in the short or long term	Significant negative impacts, including losing beaches altogether	Significant negative social impact. May discourage new or existing people from the area	Coastline / foreshore appearance degraded	Very high initial or ongoing costs, especially if low likelihood of success. Very high economic loss.	Will create legacy issues	Not recommended; Score < 0



Table 5-2 Multi-Criteria Analysis summary by MU. Green indicates options recommended for further investigation (CBA); orange cells are unclear, so will be analysed further; red cells are not recommended for inclusion or further analysis

Option	MU1	MU2	MU3	MU4	MU5
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	11	11	11	11	11
Leaving assets unprotected (PMR1)	N/A	2	2	2	N/A
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	7	7	7	7
Prevention of further development / prohibit expansion of existing use rights (PMR3)	6	6	6	10	6
Voluntary acquisition (PMR4)	4	5	5	5	N/A
Design assets to withstand impacts (AC1)	8	11	10	10	8
Beach nourishment or replenishment (PR1)	3	5	4	-1	0
Groynes (PR2)	0	-1	-2	-8	-2
Seawalls (PR3)	1	0	-2	-12	-2
Artificial reef (PR4)	-1	-2	-2	-2	-1
Offshore breakwater (PR5)	-5	-5	-5	-5	-1
Levee / Weir / Storm Surge Barrier (PR6)	N/A	3	2	1	1
Monitoring (NR1)	8	8	8	8	8
Protection Structure Audit (NR2)	8	8	8	N/A	8
Notification on title (NR3)	8	8	8	8	8
Emergency evacuation plans (NR4)	6	6	6	6	6
Do nothing (DN1)	-10	-10	-10	-7	-7



6 SUMMARY & NEXT STEPS

This report presents the risk evaluation and multi-criteria analysis for the Princess Royal harbour CHRMAP. The MCA results are presented in full in Appendix A; a summary is presented in Section 5.3.

The next report will present the cost-benefit analysis the recommended adaptation pathways for each MU and triggers, will also be presented.



7 REFERENCES

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APPENDIX A MULTI-CRITERIA ANALYSIS





The MCA Analysis for each management unit is provided in from Table 7-1 to Table 7-5 with each adaptation option assessed. Table 5-2 summarises the evaluated status of each option for each management unit.



Table 7-1 Multi-Criteria Analysis – MU1 – Point King to Melville point

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as Environmental conserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)							N/A	Suitable for low-value public assets. Currently, and for 50 yr., the Princess Royal Harbour Drive, Railway line, Environmental preserves, the Residential & Commercial properties will be protected with the existing seawall, properties are under hazard lines for 100 yr.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	2	2	-1	1	-2	-1	1	Suitable for low to medium value public assets. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders. As per CHRMAP guidelines this does not include special areas, as ports and marinas.
Voluntary acquisition (PMR4)	2	1	0	1	-2	2	4	For private property. Effective but costly option. Ensure foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy. May be ineffective to the 100-year timeframe depending on the seawall design life.
Design assets to withstand impacts (AC1)	1	2	2	0	1	2	8	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	1	-1	1	1	-1	2	3	Beach nourishment may reduce erosion once the seawall is not functional. Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	1	-1	1	0	-1	0	0	A groyne field may assist to stabilise the shoreline. Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works, which can help provide a sandy beach.
Seawalls (PR3)	2	-1	1	0	-1	0	1	Improving existing seawall may reduce both erosion and inundation, but it is an expensive option, also will reduce usable sandy beach. Can be adaptable in the future with reinforcements.
Artificial reef (PR4)	1	1	-1	1	-2	-1	-1	Difficult to design submerged structures to work effectively, and costly to build and maintain. However, based on site condition improving the existing reef for enhancing wave breaking offshore will reduce both erosion and inundation. Can add an environmental value improving diversity in the estuary.
Offshore breakwater (PR5)	2	-1	-1	-1	-2	-2	-5	Offshore breakwater will enhance wave energy dissipation offshore. Costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely.
Levee / Weir / Storm Surge Barrier (PR6)							N/A	Since inundation areas are inside the erosion zone, Levee and other controls will not be effective.
Monitoring (NR1)	2	2	1	0	1	2	8	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	2	1	0	1	2	8	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe. Important for single-road access to town.
Do nothing (DN1)	-2	-2	-2	-1	-1	-2	-10	Not an effective adaptation option and may not be popular with the community.

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Table 7-2 Multi-Criteria Analysis – MU2 – Melville Point to Rushy Point

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	1	1	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy.
Design assets to withstand impacts (AC1)	2	2	2	1	2	2	11	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	2	0	2	2	-1	0	5	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future. Not feasible over large section of coastline.
Groynes (PR2)	1	-1	2	-1	-1	-1	-1	Not feasible over large section of coastline. Groynes can be effective at stabilising shorelines but can also lead to downdrift erosion issues if not designed and constructed appropriately.
Seawalls (PR3)	2	0	2	-2	-1	-1	0	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential).
Artificial reef (PR4)	1	0	0	0	-2	-1	-2	Artificial reef will enhance wave energy dissipation offshore, existing bottom reef may improve for the purpose, however it is costly to build and maintain.
Offshore breakwater (PR5)	2	-1	-1	-1	-2	-2	-5	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential). Costly to build and maintain. Social concerns about ocean views likely.
Levee / Weir / Storm Surge Barrier (PR6)	2	1	1	-1	-1	1	3	A levee may be effective at reducing inundation since the inundation area is behind the erosion zone.
Monitoring (NR1)	2	2	1	0	1	2	8	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	2	1	0	1	2	8	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe.
Do nothing (DN1)	-2	-2	-2	-1	-1	-2	-10	Not an effective adaptation option and may not be popular with the community, since mostly residential areas are under hazard lines.

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Table 7-3 Multi-Criteria Analysis – MU3 - Rushy Point to Limekilns Point

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	1	1	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy.
Design assets to withstand impacts (AC1)	2	2	1	1	2	2	10	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	2	0	1	2	-1	0	4	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future. Not feasible over large section of coastline.
Groynes (PR2)	1	-1	1	-1	-1	-1	-2	Not feasible over large section of coastline. Groynes can be effective at stabilising shorelines but can also lead to downdrift erosion issues if not designed and constructed appropriately.
Seawalls (PR3)	2	0	0	-2	-1	-1	-2	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential).
Artificial reef (PR4)	1	0	0	0	-2	-1	-2	Artificial reef will enhance wave energy dissipation offshore, existing bottom reef may improve for the purpose, however it is costly to build and maintain.
Offshore breakwater (PR5)	2	-1	-1	-1	-2	-2	-5	Expensive option, not realistic due to the length of MU, and number of impacted assets (and hence low funding potential). Costly to build and maintain. Social concerns about ocean views likely.
Levee / Weir / Storm Surge Barrier (PR6)	2	1	0	-1	-1	1	2	A levee may be effective at reducing inundation, however not necessarily required in this MU.
Monitoring (NR1)	2	2	1	0	1	2	8	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	2	1	0	1	2	8	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe.
Do nothing (DN1)	-2	-2	-2	-1	-1	-2	-10	Not an effective adaptation option and may not be popular with the community, since mostly residential areas are under hazard lines.



Table 7-4 Multi-Criteria Analysis – MU4 – Limekilns Point to Geake Point

Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)	0	-1	1	0	1	1	2	Suitable for low-value public assets such as foreshore recreational amenities.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low-value public assets such as foreshore recreational amenities. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	2	2	1	1	2	2	10	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)	2	1	0	2	-2	2	5	For private property. Effective but costly option. Ensures foreshore reserve retained. May be unpopular with landholders, depending on implementation strategy.
Design assets to withstand impacts (AC1)	2	2	2	0	2	2	10	For inundation hazard which is projected to affect very few assets in this MU. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed.
Beach nourishment or replenishment (PR1)	-2	1	1	1	-2	0	-1	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	-2	-1	-1	-1	-2	-1	-8	Groynes can be effective at stabilising shorelines but can also lead to downdrift erosion issues if not designed and constructed appropriately.
Seawalls (PR3)	-2	-2	-2	-2	-2	-2	-12	Expensive option, not realistic due to the length of MU, and nature of impacted assets.
Artificial reef (PR4)	1	1	0	0	-2	-2	-2	Artificial reef will enhance wave energy dissipation offshore, existing bottom reef may improve for the purpose, however it is costly to build and maintain.
Offshore breakwater (PR5)	1	0	-1	-1	-2	-2	-5	Offshore breakwater will enhance wave energy dissipation offshore. It is costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely.
Levee / Weir / Storm Surge Barrier (PR6)	2	1	-1	-1	-1	1	1	A levee may be effective at reducing inundation however not necessarily required in this MU.
Monitoring (NR1)	2	2	1	0	1	2	8	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)							N/A	No existing protection structures in this MU.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe.
Do nothing (DN1)	-2	-1	0	-1	-1	-2	-7	Not an effective adaptation option and may not be popular with the community.



Table 7-5 Multi-Criteria Analysis – MU5 - Geake Point to Possession Point

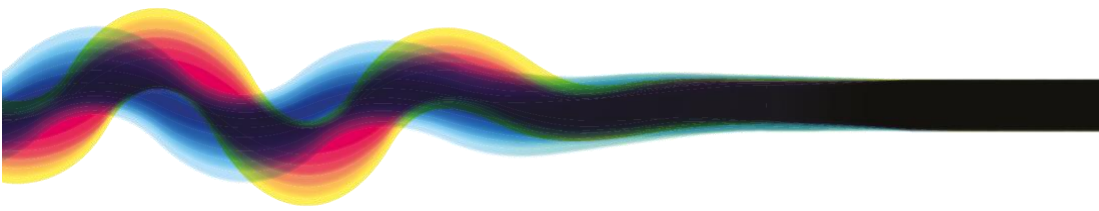
Option (Option Code)	Effectiveness	Environment Impact	Social Impact	Aesthetic Impact	Cost	Future Adaptability	Score	Comment
Locating assets in areas that will not be vulnerable to coastal hazards (AV)	2	2	1	2	2	2	11	This option applies to undeveloped land. In this MU most undeveloped land is already zoned as foreshore reserve. Any developable land in MU should be subject to this option. Community will benefit by appropriate foreshore reserve width and access throughout the planning timeframe.
Leaving assets unprotected (PMR1)							N/A	No low-value foreshore amenities in this MU.
Demolition / removal / relocation of asset from inside hazard area (PMR2)	1	2	2	1	-1	2	7	Suitable for low to medium value public assets such as facilities at Camp Quararup. Potentially costly if triggers met before asset due for replacement.
Prevention of further development / prohibit expansion of existing use rights (PMR3)	1	1	0	0	2	2	6	Allows for continued use of the land whilst viable, without creating legacy issues. May be unpopular with landholders.
Voluntary acquisition (PMR4)							N/A	For private property – none in hazard zone in this MU.
Design assets to withstand impacts (AC1)	2	2	1	0	1	2	8	For inundation hazard. Early design considerations mean implementation can occur as assets are routinely upgraded / renewed / redeveloped.
Beach nourishment or replenishment (PR1)	-2	1	0	0	-1	2	0	Potentially very expensive if no nearby suitable and sustainable sand source available. Could create legacy issues for future.
Groynes (PR2)	-2	0	-1	0	-1	2	-2	Groynes can lead to downdrift erosion issues if not designed and constructed appropriately. Would require sand nourishment as part of works.
Seawalls (PR3)	-2	0	-1	0	-1	2	-2	Expensive option.
Artificial reef (PR4)	-2	1	-1	0	-1	2	-1	Difficult to design submerged structures to work effectively, and costly to build and maintain.
Offshore breakwater (PR5)	-2	1	-1	0	-1	2	-1	Costly to build and maintain but can be designed to work effectively and provide usable sandy beach. Social concerns about ocean views likely.
Levee / Weir / Storm Surge Barrier (PR6)	2	1	-1	-1	-1	1	1	A levee may be effective at reducing inundation however not necessarily required in this MU.
Monitoring (NR1)	2	2	1	0	1	2	8	Low-cost action which causes no problems. Resulting data is required for most management approaches.
Protection Structure Audit (NR2)	2	2	1	0	1	2	8	An audit should be undertaken of all existing coastal protection structures.
Notification on title (NR3)	1	2	1	0	2	2	8	For private property. Effective low-cost option. May be unpopular with affected landholders, but appreciated by potential purchasers, depending on implementation strategy.
Emergency evacuation plans (NR4)	1	0	1	0	2	2	6	For inundation hazard. Doesn't directly address vulnerabilities of assets but low cost to plan for keeping people safe.
Do nothing (DN1)	-1	-1	-1	-1	-1	-2	-7	Since heritage sites are under hazard lines, not an effective adaptation option and may not be popular with the community.





APPENDIX B ENGAGEMENT OUTCOMES REPORT – MAY 2023





element.

City of Albany PRH CHRMAP

Interim Engagement Outcomes Report

May 2023 | 21-582

We acknowledge the Whadjuk and Menang people of the Noongar nation as traditional owners of the land on which we live and work. We acknowledge and respect their enduring culture, their contribution to the life of this city, and Elders, past and present.

Document ID: 21-582 Princess Royal Harbour CHRMAP / Project Work / Engagement / Outcomes					
Issue	Date	Status	Prepared by	Approved by	
				Name	Signature
D1	14.04.22	Draft	Hayley Campbell	Cath Blake Powell	CBP
D2	25.04.23	Draft	Yasmine Mhany & Misha White	Misha White	MW
F1					

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1. Introduction

1.1 Project Overview

A combination of natural and man-made processes has accelerated the effects of climate change and sea level rise globally, and here in Australia. Consequently, coastal hazards such as erosion and inundation are becoming more pronounced along the West Australian coastline, including along the Great Southern coastline. Following a study released by the Department of Transport in 2019, 55 coastal erosion ‘hotspots’ were announced along the Western Australian coastline and as such, in 2021 the State Government released a pool of available grant funding to address coastal erosion.

The City of Albany (the City) has recently received State Government funding for the development of a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP), which is a strategic plan to manage and identify appropriate adaptation options for specific areas of high value assets along the coast.

1.2 Report Purpose

An important part of drafting this CHRMAP is community and stakeholder engagement. Therefore, a detailed engagement plan has been prepared to guide engagement and communications with community and stakeholders throughout the project timeline. This is an **interim** report on the outcomes of the first and second stage of the engagement during Stage 1 and Stage 5 of the CHRMAP project. This report will be updated as the engagement program progresses through the various project stages.



Figure 1 Project and Engagement Milestones

1.3 Project Scope

The City have engaged the consultant team of Water Technology, Cardno and element to prepare a Coastal Hazard Risk Management and Adaptation Plan for the Princess Royal Harbour. The CHRMAP will set the framework for the assessment, by:

- identifying coastal hazards (erosion and inundation);
- analysing vulnerability for specific assets;
- identifying and prioritising management and adaptation responses; and
- providing an implementation plan.

It will also inform the community and stakeholders about potential coastal hazard risks; identify community and stakeholders' values as well as key coastal infrastructure and assets at risk; and provide a clear pathway for the City of Albany to address coastal hazard risks over time.

Ultimately, the CHRMAP will provide strategic guidance for coordinated, integrated and sustainable land use planning and management decision-making by the City of Albany.

The CHRMAP will also guide necessary changes to the City of Albany's Local Planning Strategy, Local Planning Scheme and other relevant strategies and local planning policies. The CHRMAP will be prepared in accordance with the CHRMAP Guidelines and State Planning Policy 2.6 – State Coastal Planning Policy (SPP2.6).

1.4 Study area

The study area used for the engagement has been broken down into sections, illustrated by the coloured sections on the map below.

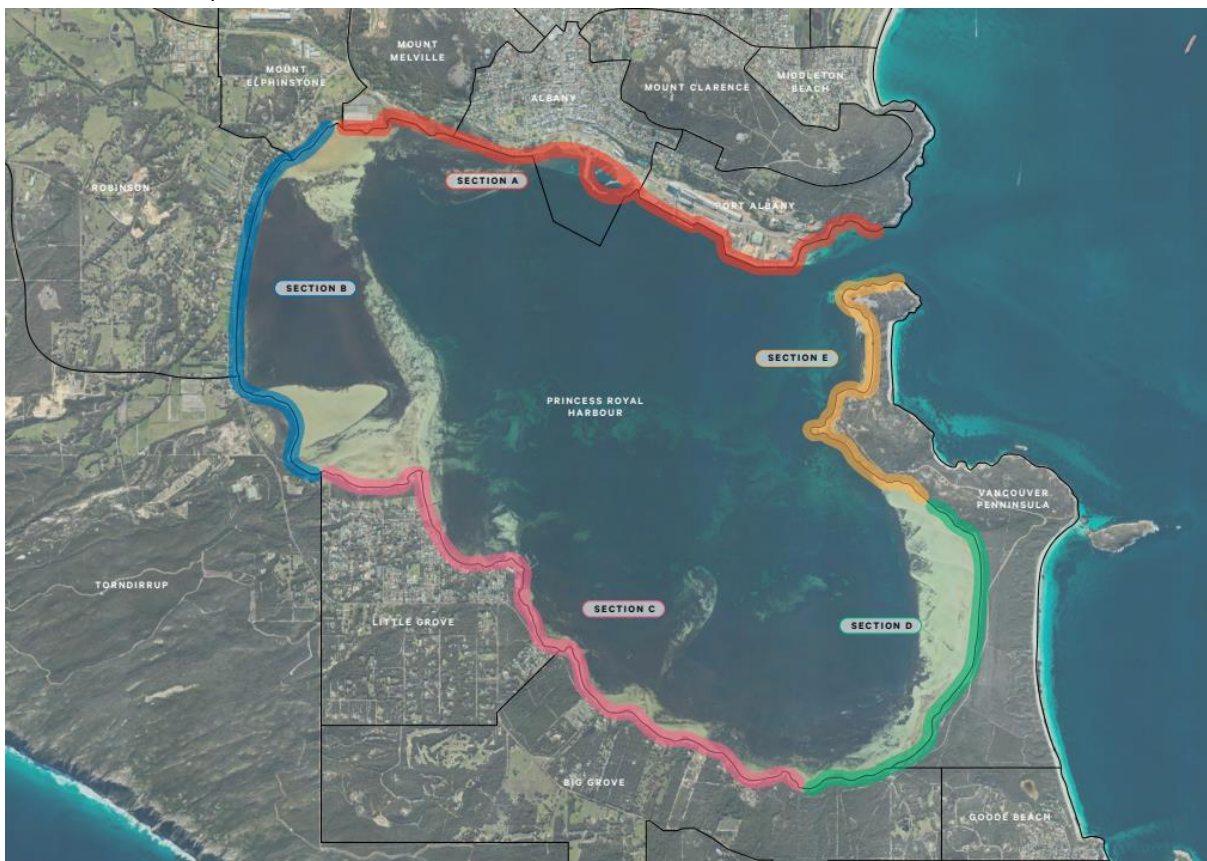


Figure 2 Albany Princess Royal Harbour CHRMAP study area

2. Objectives

2.1 Project Objectives

The objectives of the CHRMAP are to:

- Improve understanding of coastal features, processes and hazards in the study area
- Consider rainfall and catchment flooding in addition to storm surge inundation
- Identify significant vulnerability trigger points and respective timeframes for the relevant sediment cells to mark the need for immediate or medium-term risk management measures
- Identify assets (natural and man-made) and the services and functions they provide situated in the coastal zone
- Gain an understanding of asset(s) vulnerability
- Identify the value of the assets that are vulnerable to adverse impacts from coastal hazards
- Determine the consequence and likelihood of coastal hazards on the assets, and assign a level of risk
- Identify possible (effective) risk management measures (or 'actions') and how these can be incorporated into short and longer-term decision-making
- Engage stakeholders and the community in the planning and decision-making process.

2.2 Engagement Objectives

Supporting the overall project objectives, the engagement objectives are to:

- Promote knowledge and information sharing to and from community and key stakeholders to support the collection of coastal values, assets and preferred adaptation options, including but not limited to the:
 - Planning framework requirements for beneficiaries pays requirements
 - Inclusion of a Benefit Distribution Analysis to assist with apportioning the costs (capital and recurrent) of chosen risk management measures, based on the beneficiary pays principle
- Break down complicated and technical information to be easy to understand.
- Aim to reach a diverse range of community members and key stakeholders through various methods.
- Offer accessible and convenient engagement activities for the community and stakeholders to attend.
- Keep the community interested and engaged throughout the project timeline with carefully timed communications and engagement events.

3. Methodology

3.1 Engagement Tools

We used a range of engagement tools and activities to inform, consult and involve the community and key stakeholders in various ways. The main engagement tools are listed below.



Coastal Values Survey



Information Session and Intercept Survey



Community and Business Reference Group



Project Awareness Campaign



Community Scenario Workshops

Coastal Values Survey – to collect values, aspirations, and visitation along the harbour. Was structured into 12 questions (answers for questions 1 – 3 will not be included in this outcomes report as it is private information):

1. What is your name?
2. What is your street name and suburb?
3. What is your email address?
4. What age bracket do you fit into?
5. Which group do you represent? (Community member, employee in a business along the coastline, resident within 500m of the coastline, visitor or tourist to the area, none of the above)
6. How often do you visit any part of the harbour?
7. What activities do you usually undertake at the harbour's coastline?
8. If you were unable to do these activities at the PRH coast, how much would this impact your life?
9. Which section of the harbour coastline do you normally undertake these activities?
10. Why do you undertake these activities at PRH compared to other coastlines in Albany?
11. State how much you agree that it is important to manage and maintain the coastal areas adjacent to the Princess Royal Harbour in its current state for the following reasons.
12. Would you like to be kept informed about future engagement opportunities for this project?

Information Session and Intercept Surveying – to inform the community about the project, promote the survey and raise awareness

Community and Business Reference Group – to establish a group of conduits between the project team and the local community for sharing of information.

Project Awareness Campaign – to inform the community of the project, raise awareness and promote the engagement activities (such as the survey and information sessions).

Community Scenario Workshops – to inform the community of the project and projected impact from coastal processes, as well as gather feedback about asset prioritisation, the perceived consequences of coastal hazards and the preferred adaptation strategies and management options along the foreshore coastline.

3.2 Communication Channels

The 'Project Awareness Campaign' included a diverse range of communication channels to help raise awareness of the project and the engagement activities for stage 1. These were:

- Project webpage on the city of Albany 'Current Projects' site, with information on the project, FAQs and information on all engagement activities, including a link to the survey. The webpage has been promoted through all communication material and will continue to be updated as the project progresses.
- A3 posters distributed around the Albany town centre
- Letter to over 700 residents adjacent to the harbour
- Social Media Posts prompting the survey via Facebook
- E-newsletter article
- Email campaign to key stakeholders
- Direct email invitation to selected stakeholders to join the community and business reference group (plus follow up email to local businesses located along the harbour)
- Word of mouth promotion via the CBRG members.

4. Key findings

4.1 Engagement snapshot

The following table provides a quick snapshot of engagement numbers for Stage 1 of the project.

Method	Numbers	Level of engagement achieved
Stage 1		
Survey	55 respondents	Consult
Information Session	45 attendees	Inform / consult
Intercept survey / flyer drop (opportunistic)	20+ flyers distributed	Inform / consult
Letter	700+ distributed	Inform / consult
Social media posts	5+ posts	Inform / consult
Email campaign	45+ stakeholders	Inform / consult
Stage 5		
Letter	600+ distributed	Inform / consult
Poster	4 public locations	Inform / consult
Social media posts	5 posts	Inform / consult
2 x Workshops	36 attendees	Consult
Ongoing		
Community and Business Reference Group	12 members to-date.	Involve

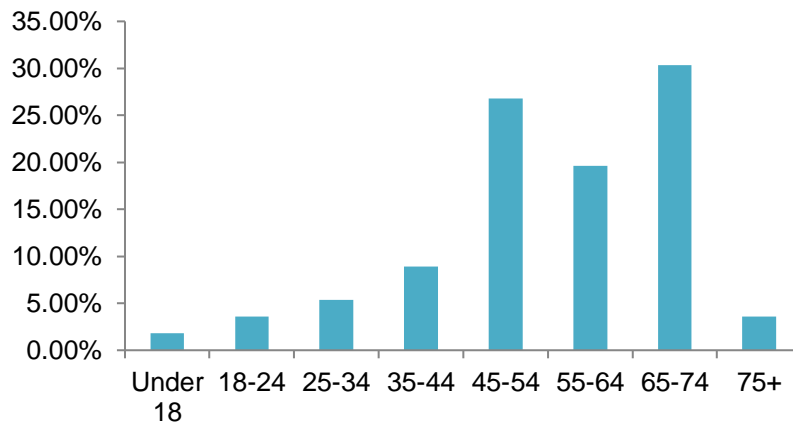
4.2 Coastal Values Survey

The Coastal Values Survey ran from 21 February 2022 to 11 April 2022, collecting a total 55 responses. A summary of their responses is presented below.

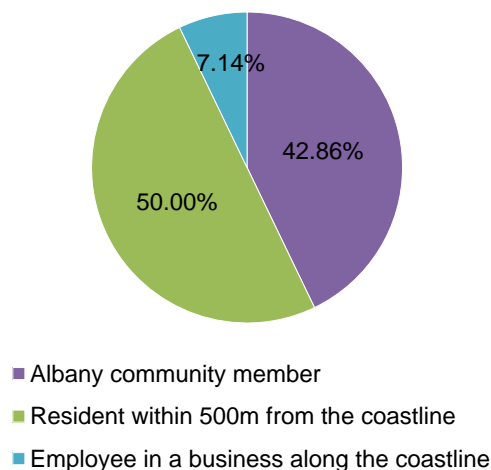
4.2.1 About you

A large portion of the survey respondents were aged between 65-74 years (30%), with majority of survey respondents being aged over 45. Almost all respondents were either a community member or a resident within 500m of the coastline.

What is your age bracket?



Which group do you represent?



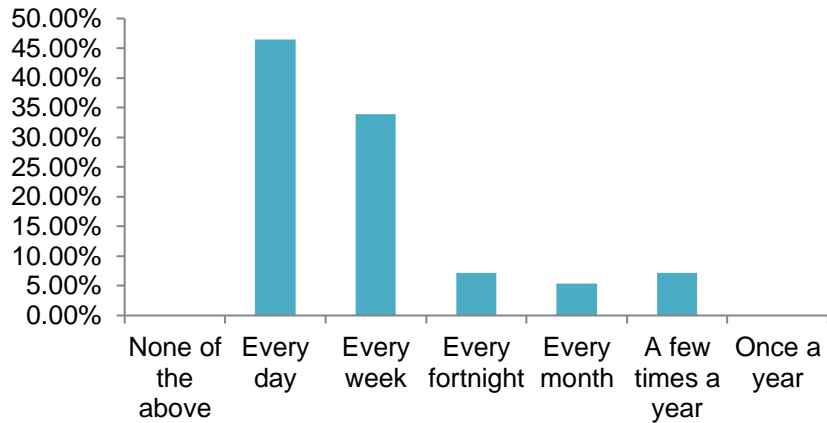
4.2.2 Visitation and activities

Combined, majority of respondents either visit the harbour daily (45%) or weekly (33%). While responses were quite evenly spread in terms of activities undertaken at the harbour, the top 5 activities were:

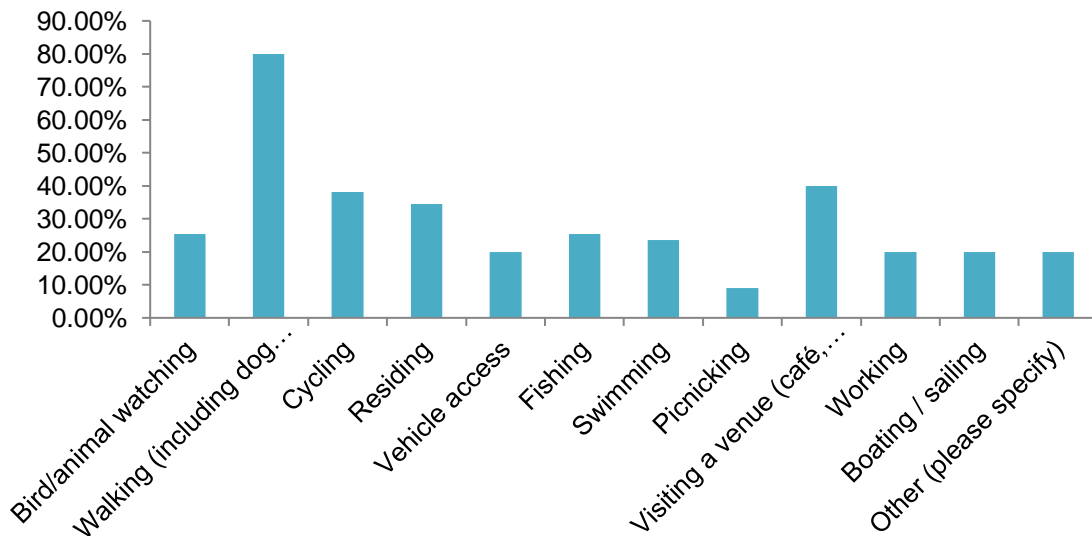
- Walking (including dog walking) – 80% respondents selected this option
- Visiting a venue – 40% of respondents selected this option
- Cycling – 38% of respondents selected this option
- Residing – 34% of respondents selected this option
- Fishing – 24% of respondents selected this option.

Other responses mentioned by respondents included horse riding, enjoying the view, kayaking/SUP and collecting rubbish.

How often do you visit any part of the PRH coast?



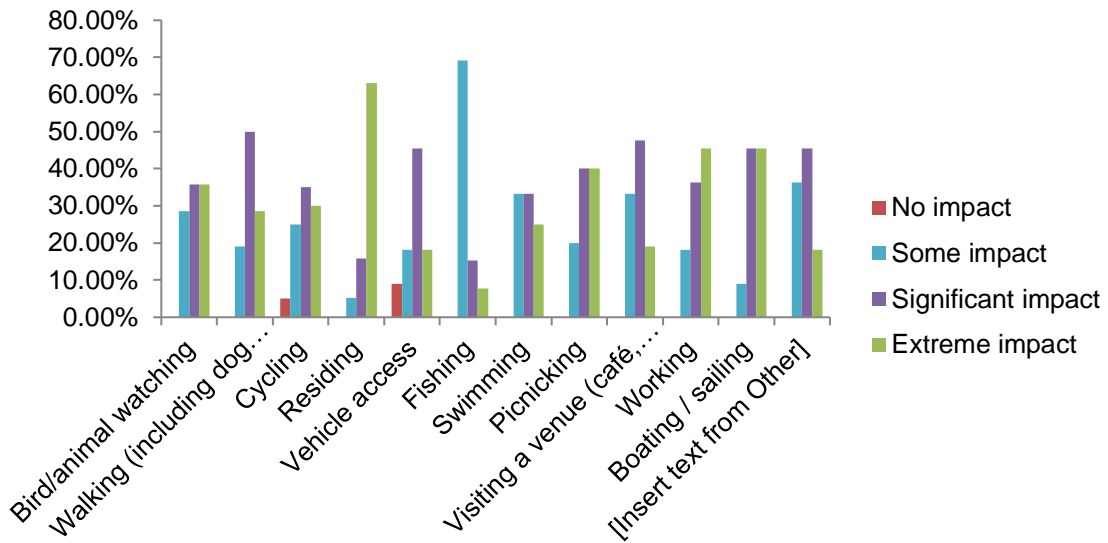
What activities do you usually undertake at the harbour's coast? Please select up to 5 activities:



4.2.3 Activities and their value

If respondents were not able to reside, visit or work at the harbour, due to the impact of coastal hazards, they noted it would have an extreme impact on their life, while a small portion noted a significant impact. For most other activities, if respondents were unable to do these at the harbour it would result in a significant impact to their life, indicating their strong value in the ability to interact with Princess Royal Harbour. Fishing had the least impact to respondents' lives.

If you were unable to do these activities at the PRH coast, how much would this impact your life?



4.2.4 Activity locations



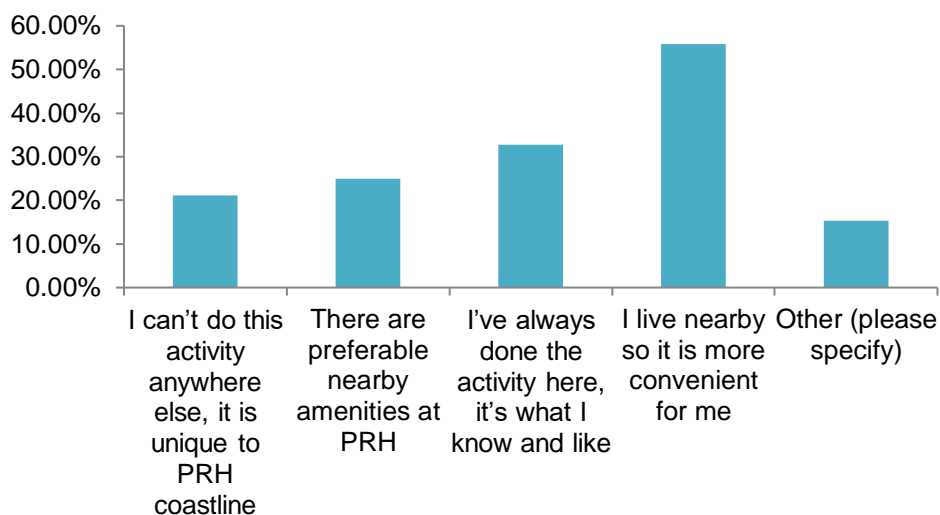
Referring to the Study Area Map above and also shown in Section 1.4, respondents were asked to select where they most-commonly undertake an activity within the PRH coastline. Results are presented in the table below.

Section	Activity (n=)*
Section A	Visiting a venue (n=15, 26%) Walking (n=13, 22%)
Section B	Walking (n=11, 29%) Cycling (n=9, 24%)
Section C	Walking (n=13, 24%) Residing (n=9, 16%)
Section D	Other (horse riding, kayaking, enjoying the view, collecting rubbish) (n=4, 33%) Swimming (n=3, 25%)
Section E	Fishing (n=4, 21%) Swimming (n=3, 16%) Boating/ sailing (n=3, 16%)

*top locations shown

Respondents typically do these activities within the PRH coastline as they live nearby so it is more convenient.

Why do you chose to undertake these activities at the PRH coastline compared to other parts of the Albany coastline?



4.2.5 Values of maintaining the PRH coastline

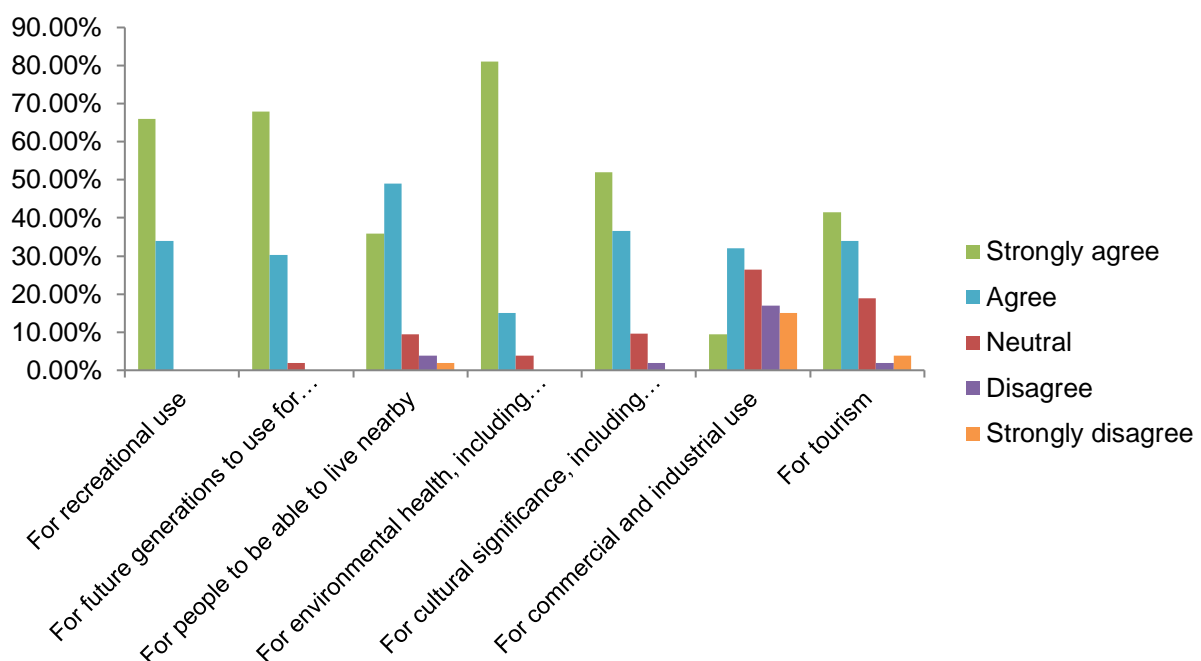
Survey respondents mostly responded 'strongly agree' to the following statements:

- For environmental health, including flora and fauna habitat (81% chose strongly agree)
- For future generations to use for recreation (67% chose strongly agree)

- For recreational use (66% chose strongly agree)
- For cultural significance, including Aboriginal and European heritage (52% chose strongly agree)
- For tourism (42% chose strongly agree)
- For people to be able to live nearby (35% chose strongly agree)

However, for commercial and industrial use, there was a mixed response of agree (32% selected), neutral (26%), disagree (16%), strongly disagree (15%) and strongly agree (9%).

State how much you agree that it is important to manage and maintain the coastal areas adjacent to the Princess Royal Harbour in its current state for the following reasons



4.3 Community and Business Reference Group

The Community and Business Reference Group (CBRG) underwent an Expression of Interest period from 21 February until 11 March. The group currently has 13 representatives, 9 from community and 3 local business representatives and 1 government representative.

There have been 2 meetings of the CBRG held to date being on 24th March 2022 4-5.30pm and 28th March 4.30-7pm.

4.4 Information Session & Intercept Surveying

An Information Session was held on Saturday 2 April 2022 from 10am – 2pm (4 hours) on the lawn outside Haz Beanz Café. The purpose of the session was to inform community members of the project and allow them to ask any questions and provide any feedback related to the project. The session was attended by element (engagement and planning), Cardno (coastal engineering), and the City of Albany. There was a total of 45 attendees.

The Information Session included, apart from communicating general information about a CHRMAP, one data capturing exercise. The purpose being to test community aspirations for the coastline. Attendees were asked to rate the following sentences from ‘very important’ to ‘not important’. The results are as presented below:



Figure 3 Image of attendees from the Information Session (left) and results from the exercise (right).

Statement sentence	Rating
In 20 years, the land in the coastal zone associated with the harbour <i>will be provided for foreshore management, public access, recreation and conservation.</i>	Very important, n=7
In 20 years, land in the coastal zone associated with the harbour <i>will have reduced risk associated with erosion.</i>	Very important, n=6 Somewhat important, n=1
In 20 years, land in the coastal zone associated with the harbour (land at risk of coastal erosion and inundation) <i>will be managed to avoid inappropriate land use and development.</i>	Very important, n=7
In 20 years, land in the coastal zone associated with the harbour <i>will be managed to ensure land use and development does not accelerate coastal erosion or inundation risks or have a detrimental impact on the functions of public reserves.</i>	Very important, n=9

In addition, an opportunistic intercept survey and flyer distribution was undertaken on Sunday 3 April from 10am – 12pm at the Albany Boatshed Markets. Over 20 flyers were distributed to promote the survey and continue to raise awareness of the project.

4.5 Community Scenario Workshop

Two community scenario workshops were held on the 4th and 6th of May. The workshops were held at the City of Albany offices and were two hours long. element, the City of Albany and Water Technology (coastal scientist) were in attendance.

During the workshops, participants were placed in small groups and worked together to provide feedback.

A total of 36 attended. The 4th of May session saw 23 community members attend, with 13 on the 6th of May session.



Figure 4 Image of participants from the Community Scenario workshop

The objectives of the workshops were to:

- Share knowledge: CHRMAP, coastal hazards adaptation approaches
- Provide key information from previous stages.
- Gather feedback from the community
- Identify and prioritise coastal assets and determine why these are important
- Identify the consequence of erosion or inundation on key assets
- Identify potential adaptation and risk treatment options that could address the risks

The workshops consisted of three key tasks.

1. **Coastal Assets Identification and Prioritisation:** Community members were asked to identify the coastal assets that were important to them and their reasoning by writing them out on post-it notes and placing them on a map provided during the workshop (shown in Figure 5).

The top 5 assets were then identified and marked with dot stickers. Environmental, social, and economic assets were encouraged to be thought about.

2. **Consequence Scale:** For identified assets, participants were asked to assign a consequence rating if the asset was subject to coastal hazards based on the scale illustrated. Participants were asked to think about the consequence of erosion and inundation.

Consequence	Score
Insignificant	1
Minor	2
Moderate	3
Major	4
Catastrophic	5

Each group used the map below as a basis for completing the task which showed the hazard lines for both erosion and inundation for the 2122 timeframe.

It was also noted that for the full extent of coastal hazards on the Vancouver Peninsula was not shown on the map as no coastal hazard study had been conducted on the ocean side.

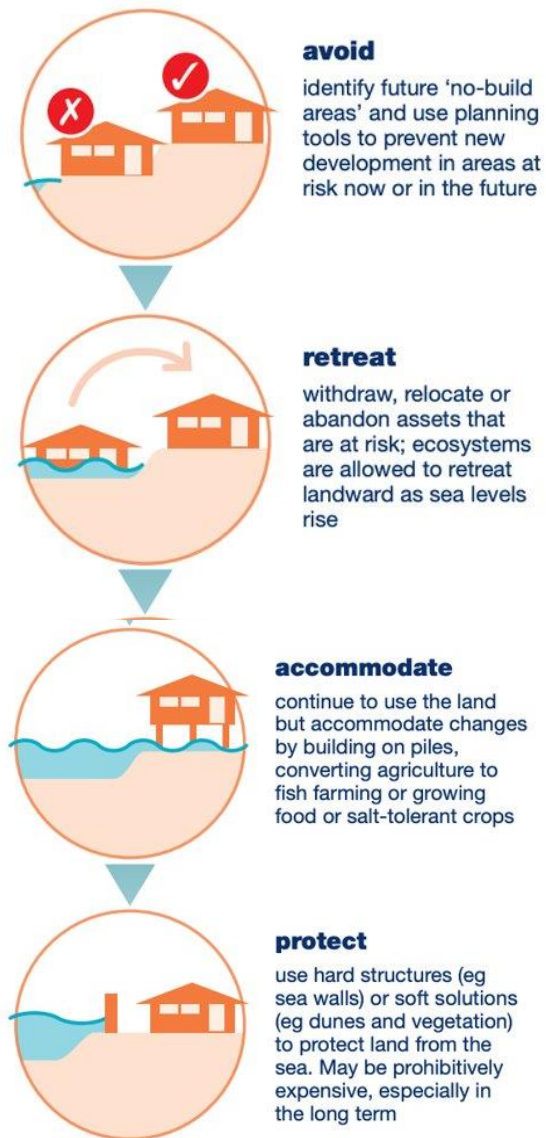


Figure 5. Map with 2122 coastal hazard lines for erosion and inundation used for workshop group exercises

3. **Adaptation Strategy:** The adaption strategies (shown below) were explained to participants and examples of coastal engineering management options that could be used were also presented.

Groups were then asked to choose at least three coastal sections on the map and discuss their preferred adaptation strategy (shown below), as well as their adaptation management option ideas.

Participants were also able to provide responses for specific assets, part of a coastal section or the entire section.



The Study Area sections discussed below are outlined earlier in Section 1.4 of the report.

4.5.1 Coastal Asset Identification, Prioritisation and Consequence Scale

The highest priority assets across both workshop days were: Frenchman’s Bay Road (n=19), the Port (n=16), residential in Section B (n=14), and residential in Little Grove - Section C (n=10).

Section A and E were noted as having the least assets of importance across the PRH.

In terms of consequence there was a number of infrastructure items noted as having catastrophic consequences for the community including road access, power, water, sewer and fibre optic supply.

In addition, the consequence for residential properties and the foreshore area were also noted as being catastrophic.

Overall the effect on Section B was seen as the most catastrophic, with Section’s A and E not having any catastrophic consequences.

Full results can be found in the tables below.

Section A

Workshop	Asset	Why is it important	No. of sticky notes	No of dots (priority)	Average consequence score
1&2	Port	Economic, recreation and tourism value for whole town and region	10	16	4.4
1&2	CBD	Retail and work; economy, tourism, social, community	3	4	3
1	Marina Café & Hotel	Community, recreation, and tourism value	1	2	1
2	UWA	Education	1	1	1

Section B

Workshop	Asset	Why is it important	No. of sticky notes	No of dots (priority)	Average consequence score
2	Power supply fibre optic cable	Power to water plant for Albany	1	1	5
2	Water supply	Supply of water to Albany, Denmark & Mount Barker	2	4	5
2	Princess Royal Drive access to Port		1		5
1	Underground infrastructure: water, sewerage, power	Local neighbourhood	1	0	4.7
1&2	Low rise residential between FBR & PRH	People's homes	8	14	4.6
1	Rusty Point	Important for native fauna	2	0	4.3
1&2	Frenchman Bay Road (FBR)	Important for cycling, recreation, communiting to work.	14	19	4.1
1	Bay View Drive	Great views while driving	1	2	4
1	Water treatment plant	Critical infrastructure	1	0	4
2	Water catchment	Infrastructure	2	3	4
1	Woolstores development	Valuable site will require careful planning	2	2	3.75
1	Rushy Point	Recreation and enjoying nature, exercise and water activities	3	2	3.5
2	Shoal Bay Beach	Exercise, nature connections, roads, foreshore buildings, housing	2	7	3.5
1	Anzac Park	Point for important celebrations	1	0	2.75
1	Fire station	Emergency service	1	1	1.5
2	Sea Wolf Road Beach	We need water	1		Not indicated

Section C

Workshop	Asset	Why is it important	No. of sticky notes	No of dots (priority)	Average consequence score
1	Chipana drive foreshore	Now eroding and flooding	1	2	5
2	Flora and fauna between harbour and residential	Act as buffer zone and protection	2	2	4.5
1&2	Little Grove residential	People's homes	5	10	4.2
1&2	Yacht Club	Community and recreation	5	9	3.8
1	Little Beach	Important for community, children and tourists. Homes in the neighbourhood to be able to live and enjoy the sunrise and views.	3	3	3.3
1	School	Education and social connection	1	0	3
2	Youth Camp	Youth education, community and socialising	1	1	3
1	Caravan Park	Tourism and economy	2	0	1.7
2	Wildlife	Connection to nature	1	2	1
1	Lack of parks/rust areas around harbour	No reason provided	1	1	Not indicated

Section D

Workshop	Asset	Why is it important	No. of sticky notes	No of dots (priority)	Average consequence score
2	Foreshore	Active lifestyle, residential	2	1	5
2	Water body	Boating, wind-surfing, canoeing etc	1	5	5
2	No more aquaculture in PRH	-	1	3	5
2	Water supply	Infrastructure	1	1	4
2	No more Harvest Road	-	1	3	3.7
1	Access to beach	Recreation and enjoying nature	2	0	3.6
1	Fish breeding ground and sea grass meadows	Native flora and fauna	1	0	3
1	Limeburner Point	People's homes	1	2	Not indicated

Section E

Workshop	Asset	Why is it important	No. of sticky notes	No of dots (priority)	Average consequence score
1	Vancouver Islands	Ocean breakthrough	1	1	4.5
1&2	Quaranup Islands	Ocean breakthrough, fishing, noongar meeting place	5	5	3.5
1	Camp Quaranup	Historical significance and outdoor recreation facility	2	1	2.7
1&2	Vancouver Beach	Vehicle damage to beach, restrict to people and animals	3	5	2.3

General

A number of assets were considered to cover more than one section and so are noted separately below.

Workshop	Asset	Why is it important	No. of sticky notes	No of dots (priority)	Average consequence score
1	Native vegetation around PRH	Effective shoreline protection	5	8	4.6
1	Road access around the harbour		2	5	4.3
1	Bike/walk path around the harbour	Exercise in a beautiful environment	2	2	4
1&2	Goode Beach	Recreation and enjoying nature. Dunes and edge vegetation important for the environment.	2	0	3.5

4.5.2 Adaptation Strategies and Management Options

The final workshop task involved developing adaptation strategies and preferred options for prioritised sections. Adaptation strategies were explained and examples of potential management options were presented, to assist with this task, although it was made clear participants could also suggest their own.

The first step was for participants at the table to identify their priority sections, and then discuss which adaptation strategies they wanted to implement to mitigate risk. Following this, groups identified an adaptation management option they preferred be implemented. They could either choose one of the options presented or develop their own.

Whilst avoid and accommodate were the most mentioned adaptation strategies, protect also featured highly. Avoid was the major strategy for future housing and infrastructure.

Planning controls as a management option were seen as a way of avoiding future issues for residential development in affected areas.

Frenchman Bay Road was an essential access for the area. Participants wanted this asset to be built up or rerouted. A seawall was also mooted in the longer term.

The full list of adaptation strategies and options are shown in the Tables below.

Section A

Group number	Location (if specified)	Preferred adaptation strategy	Management options
1	-	Protect	Sandbags or a seawall long term. Breakwater for port area.
1	-	Avoid	Future building of valuable assets
3	-	Retreat	Protect if needed
3	-	Do nothing	

Section B

Group number	Location (if specified)	Preferred adaptation strategy	Management options
1	Frenchman Bay Road	Protect	Bioengineering
1	Housing	Retreat	
1		Accommodate	Different approaches to adapting housing -- individual buffering
2	Residential	Avoid	No more planning. Consider new access road taking into account impact on residents along existing roads
2		Accommodate	Provide support for residential property owners to protect themselves from inundation
3	South-western edge of harbour	Protect	Seawall is the best option as it could be extended if & when required. It would protect vital public and private assets eg. Water supply to Albany, Denmark & Mt Barker, road to Albany's major tourist attractions, power for whole peninsula etc. Allow property owners to build their own defences, retaining walls etc.
3		Accommodate	Plan for duplicate road access from Goode Beach to town

Section C

Group number	Location (if specified)	Preferred adaptation strategy	Management options
2	Sewerage	Avoid	Don't extend further
2	Residential	Avoid	No more development planning, consider future limits on sales for residential, provide permissions and support for people to develop their own properties for future.
2	Yacht club	Withdraw	
2	Caravan Park	Retreat	
3		Accommodate	Examine soil types and review
3		Protect	

Section D

Group number	Location (if specified)	Preferred adaptation strategy	Management options
3		Do nothing	Recreation now and future. Keep aquaculture out.

Section E

Group number	Location (if specified)	Preferred adaptation strategy	Management options
1	Quaranup Road*	Avoid	Housing on coastal dune areas
		Accommodate	Mitigation strategies within harbour build up Quaranup Road* to higher level

*The group originally wrote Frenchman Bay Road however it does not extend to Section E; it is assumed that they were referring to Quaranup Road.

5. Success Criteria

As a result of the engagement findings to date, a set of criteria which will be used to guide the success of the CHRMAP report is outlined below. The 'success' of the CHRMAP will be determined by the assets identified through the CHRMAP process continuing to provide their present function, services and values (or an accepted version of it as determined by community and stakeholders).

Therefore, the success criteria will be determined by the values collected as part of the engagement process. The preliminary success criteria are outlined below based on the insights gained from survey in Stage 1 and the community workshops in Stage 5.

- Ensure the harbour's natural environment is protected and sustained, including flora and fauna habitat.
- Preserve the function and opportunity for land and water-based health & well-being and recreation activities within the harbour area.
- Ensure future land use and development does not accelerate coastal erosion or inundation risks or have a detrimental impact on the functions of public reserves.
- Land at risk of coastal erosion and inundation will be managed to avoid inappropriate land use and development in the coastal zone associated with the harbour.
- Ensure that essential infrastructure is maintained or managed appropriately to ensure ongoing supply and access including water, sewerage, roads etc.
- Maintain and support the current and future economic viability of the Port and its functions.
- Maintain safety for all, especially those who live and work along the harbour.
- Revisit regularly with community and key stakeholders their values and views in relation to assets within the harbour area.

6. Next steps

This concludes the end to the Stage 5 engagement activities, with most of the engagement activities completed. The next steps are:

- Watertech will incorporate the findings from the recent engagement into the draft CHRMAP.
- An additional CBRG will be held to discuss the draft CHRMAP results.
- Once the draft CHRMAP is complete there will be a public comment period and community members that participated in the CHRMAP process, along with key stakeholders will be informed.





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