Inverloch Region Coastal Hazard Assessment

Adaptation Actions Technical Assessment Report Summary October 2022

Improving our ability to plan, manage and prepare for the impacts of coastal hazards between Cape Paterson and Cape Liptrap, delivered as part of the Cape to Cape Resilience Project.

The Inverloch Region Coastal Hazard Assessment has combined technical data and stakeholder values to help select and assess the technical feasibility of five adaptation actions aimed at addressing coastal hazards on the Inverloch open coast foreshore.

Various coastal adaptation actions can be used to manage coastal risk and this report assesses the possible engineering-based actions for Inverloch foreshore. Adaptation actions can be tools, decisions and on-ground works.

This summary shares the adaptation actions assessed in the Technical Adaptation Actions Report by Water Technology (2022). It is one of the seven reports from the Inverloch Region Coastal Hazard Assessment. Refer to the full report for more details.

The project seeks to understand the natural coastal processes that result in present day coastal erosion and inundation hazards and project what these hazards look like in the future. Coastal hazards along the Inverloch coastline pose a high level of risk to Bunurong Road and the Surf Beach dunes between Flat Rocks and Point Norman. Natural erosion and variation of the dunes along this coastline is driven by eastward sediment transport and storm activities.

The coastal environment between Flat Rocks and Point Norman is close to 100% natural with only the (relatively) short seawalls at Bunurong Road and at the Inverloch Surf Life Saving Club interfering with the existing coastal processes.

Any engineered adaptation actions implemented along this coastline would be designed to alter these natural processes to protect values, assets and infrastructure located in the hazard zone.

Adaptation actions to address this coastal erosion for the current planning horizon and sea level (present day to 2040) have been assessed to allow for future coastal adaptation.

The assessed actions and resulting concept designs form part of the adaptation pathways approach that help us to ensure the most effective tools are used at the appropriate time in response to coastal changes and risk.

The rapid rate of coastal erosion in this area is likely to be influenced by the entrance configuration and loss of the ebb tide delta (offshore sand bar) at Point Norman. The ebb tide delta may return and assist in stabilising the shoreline, however both short- and longer-term risks posed by coastal hazards remain.

Coastal Asset and Values Risk Assessment

Using the coastal hazard zones, we identified assets and values which may be impacted at different planning horizons. The exposure, and the consequence of the exposure of these assets to these hazards, was used to generate coastal hazard risk profiles. Bunurong Road, Wreck Creek and Surf Beach were identified as having high risk profiles, and the adaptation actions assessed in this report have been tailored to respond to these risks and the values identified as important by community and stakeholders.

Land management planning and design, and nature based actions were reviewed along with engineering options. The coastal engineering adaptation actions that are the focus of this assessment align with the ‘protect’ approach in Victoria’s Marine and Coastal Policy (2020).

Multi Criteria Analysis

A multi criteria analysis (MCA) was developed to compare alternative actions and selected key assessment criteria. The MCA applies a semi-qualitative and quantitative approach to compare alternative actions, using technical and engagement information.

The MCA in this assessment was used to shortlist five engineering actions for detailed technical assessment. The actions were assessed initially for a preliminary 20 year design life, to enable short or longer term incorporation into adaptation pathways planning.

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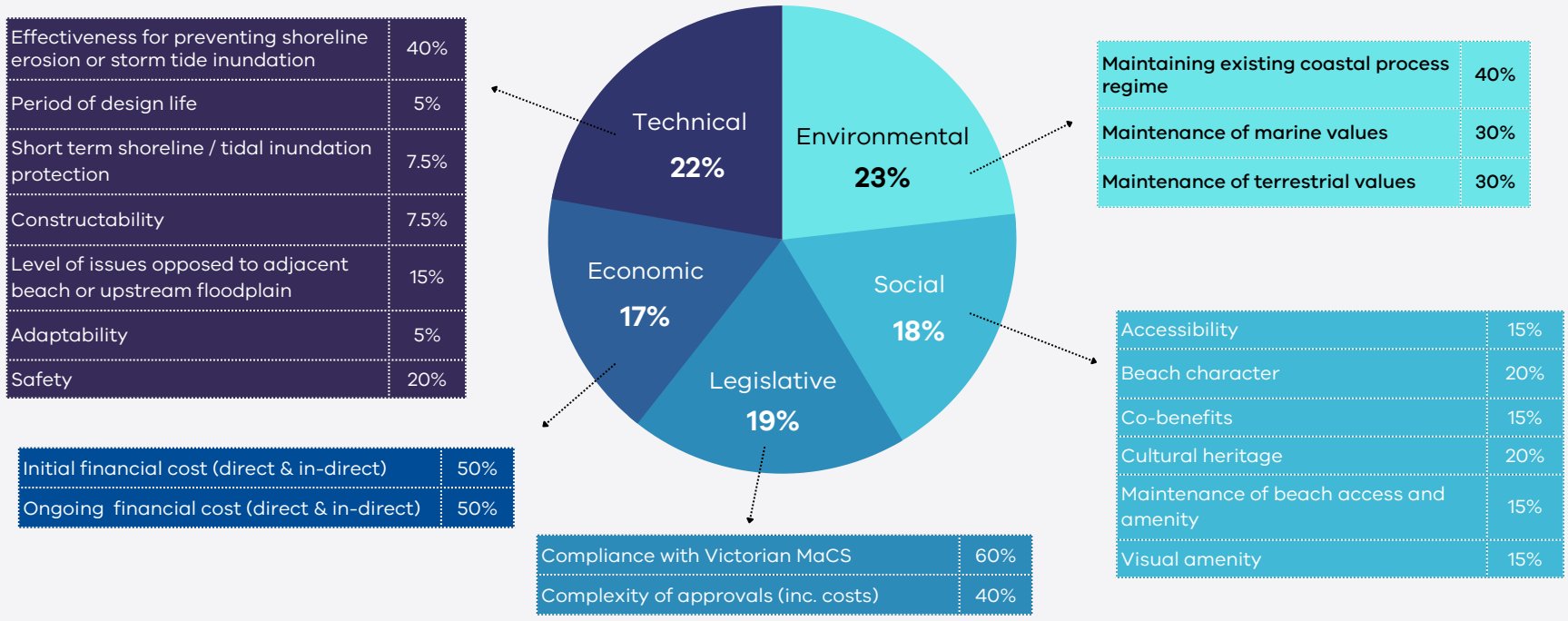

Figure 2. Image showing the multi criteria analysis (MCA) theme weighting

Bunurong Road (Flat Rocks to Wreck Creek)

Bunurong Road is an important asset facilitating connection between Cape Paterson and Inverloch as well as to the many beaches, sites and properties accessed by the road.

The MCA identified beach renourishment and seawalls as engineering adaptation options for this section of the coastline which scored well across the different criteria, and further technical feasibility assessments were completed for these options.

Surf Beach

The Surf Beach dunes and beach were identified as important social assets to the community. The area behind the dunes has significant public utilities as well as private property.

The MCA identified beach renourishment as the most appropriate engineering adaptation action for this location, with ongoing nourishment and management the best approach. In conjunction with beach nourishment, three 'hard' engineering options to retain nourished sand and reduce the need for constant beach management were assessed: a groyne field, a series of nearshore breakwaters, and a long groyne at Point Norman.

The options were assessed due to good performance in the MCA and a high level of interest from the public regarding their feasibility.

Technical Assessment

The technical assessment of the five shortlisted engineering actions was designed to review their general effectiveness, performance and risk to the adjacent shoreline. All designs have been modelled to provide protection in a 2% AEP storm.

The proposed design life was developed to meet the planning horizon to 2040, which is short for engineered structures and interventions, but meets the community's expectation of addressing the present day erosion issues whilst allowing adaptation pathways planning to progress.

Bunurong Rd Beach Renourishment

75,000 to 100,000m3 would be required for a "sacrificial" beach to prevent erosion in 2% AEP storm. Ongoing re-nourishment of up to this volume may be needed annually.

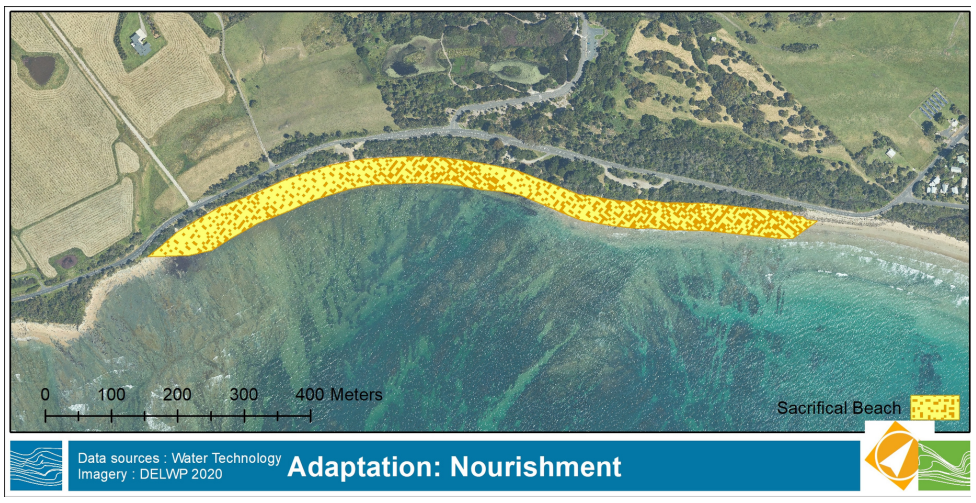

Figure 3. Conceptual extent of sacrificial beach nourishment

Positives	Negatives
• Natural alongshore transport of sand would benefit Surf Beach • Can be short term whilst adaptation planning is progressed • Less chance of long-term impacts (reversible) • Allows natural processes to take place	• Risk of impact on Anderson Inlet entrance dynamics with the continued large volume of imported sand for nourishment • High risk of impacts on intertidal habitat at Flat Rocks • Potential to increase inundation risk landward of Bunurong Rd through blocking of existing drainage paths • Change in beach amenity from wide flat beach to high dune • Requires investment in regular maintenance nourishment, possibly 100% of the original volume/year • Community could view the need to regularly renourish as a failure of the action

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Bunurong Rd Seawall

1,020m of seawall would be required to protect the entire length of the beach/road interface. Design would need to address drainage.

Positives	Negatives
• Would prevent structural failure of road and protect utilities in the road reserve • Can be short term whilst adaptation planning is progressed	• Would need to be up to 1km long; difficult to remove in future • Over wash in a storm could still occur, damaging the top of the wall making the road unsafe • Potential to increase inundation risk landward of Bunurong Rd if drainage not maintained/improved • The beach/seabed in front would be lowered (toe scour); beach/dune at the ends would also scour • Significant impacts on beach views, and use/access, particularly at high tide

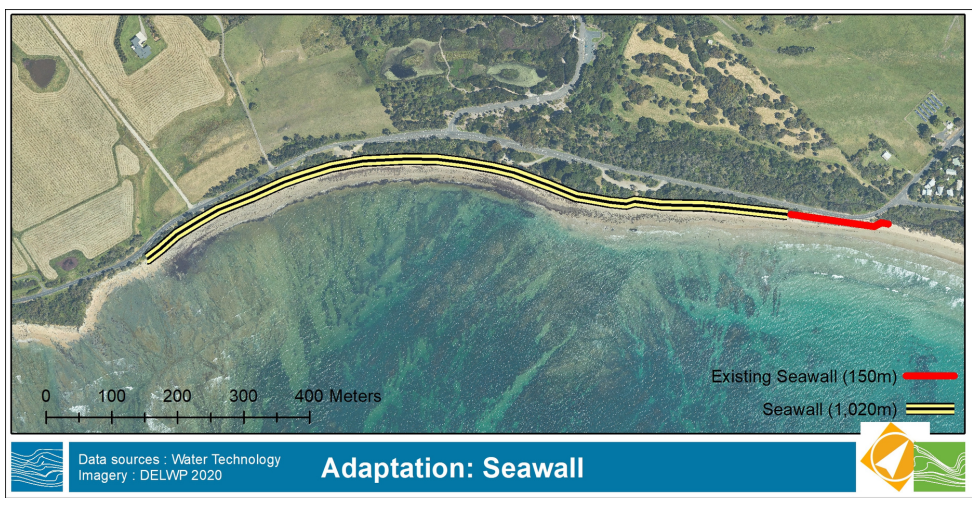

Figure 4. Conceptual design - Bunurong Rd Seawall at Flat Rocks

Surf Beach Groynes and Nourishment

Three groynes of 180 – 210m along Surf Beach, with additional groynes likely into Anderson Inlet over time. Groynes would need to be around 4m high and 14m wide at seaward end.

Initial beach nourishment of 100,000 – 200,000m3 could be required to allow for realignment to provide an ongoing sacrificial beach.

Positives	Negatives
• Would prevent erosion of existing beach and dune, maintain vegetation buffer • Can be constructed using geotextile containers for reversibility & reduced visual impact	• Groynes would have a significant visual impact on the beach, especially at low tide • Beach would be very wide in parts, up to 80m • Inundation risks to land behind Surf Beach due to impacts on drainage of Wreck Creek • Significant impacts on beach views • Change in beach amenity from wide flat beach to steep sloping dune • Groyne closest to Point Norman could cause the main entrance channel to move and deepen • Potential erosion of beach east of Point Norman, moving channel closer to Surf Parade and Veronica Street. • Impact on Point Norman coastline uncertain • Requires investment in ongoing renourishment

Figure 5. Conceptual design – groyne configuration Surf Beach

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Nearshore breakwaters

Conceptual configuration of eight nearshore breakwaters, ranging between 80m and 145m long, 4 to 4.5m high, placed 150m to 200m from the present day shore..

Positives

- Would protect the coastline by reducing wave energy reaching the shore
- Reduction in alongshore sediment transport
- No structures on the beach

Negatives

- Significant visual impact on the beach
- Significant change in beach type along the shore (i.e. impact waves coming ashore)
- Coast to the east of last breakwater would recede due to lack of incoming sediment from the west
- Additional coastal protection or groyne field may be required in future to the east
- Complex entrance dynamics create uncertainty of significant impacts on eastern side end of breakwaters
- Potential for beach to join a breakwater and block sediment transport eastward
- Very large rock required may be difficult to source
- Sacrificial beach would require monitoring and regular renourishment
- Inundation risks to land behind Surf Beach due to impacts on drainage of Wreck Creek
- Surfing and beach use would be impacted by reduced wave energy
- Beach may widen significantly and may not be liked by beach users
- Breakwaters would need to be exposed above low tide level by 2 to 2.5m
- A lot of seaweed may get trapped between the breakwaters and the beach
- Likely erosion of adjacent beaches

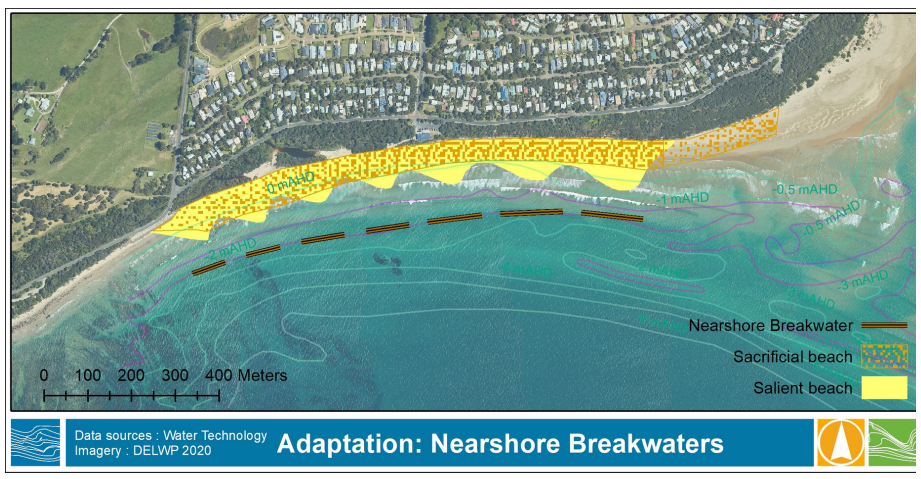

Figure 6. Nearshore breakwaters concept design

Long Groyne Point Norman

Groyne 300m to 500m is required to anchor enough sediment to realign the beach and protect the coastline at Wreck Creek. Beach nourishment volumes required to achieve this protection are unknown and the initial storm demand of approximately 100,000m3 would be required to be managed or increased as the beach realigned.

Positives

- May reduce the rate of dune recession
- May provide a buffer to the existing dune during storm events
- Minimise loss of sand towards Anderson Inlet

Negatives

- Beach width 50 – 80m at initial sacrificial nourishment. Potentially a very wide beach may form along the groyne at Point Norman
- Significant impact on beach aesthetics
- Inundation risks to land behind Surf Beach due to impacts on drainage of Wreck Creek from sacrificial nourishment
- May require regular relocation of sand from near the groyne back towards Bunurong Rd
- Complex entrance dynamics = uncertainty of significant impacts on eastern side of groyne
- Coast to the west would erode, receding toward Surf Parade
- Tidal channel may form along east side of groyne
- Entrance channel could move closer and deepen at groyne, construction complexity would be high to minimise risk of structural failure
- Additional coastal protection or groyne field may be required in future
- Significant impacts on beach views
- Unlikely to provide stable beach protection, especially at the western end of Surf Beach
- Size of rocks/sandbags required would be difficult to source & construction complicated
- Potential beach very wide adjacent to groyne
- Requires investment in ongoing renourishment and sand relocation

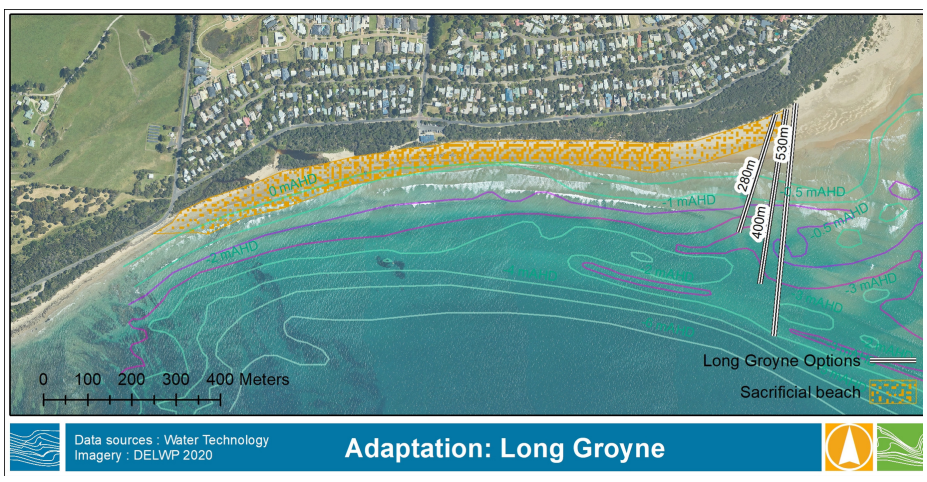

Figure 7. Conceptual design - Long groyne at Point Norman

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Engineering Adaptation Recommendations

All five engineered coastal protection actions have advantages and disadvantages. They all require significant capital works and ongoing maintenance costs. All come with risks and many of the impacts cannot be predicted or modelled because of the entrance dynamics and variability of the future wave and storm climate.

The options recommended below allow for community and stakeholder decision making when developing the future adaptation pathways

Flat Rocks to Bunurong Rd

Pathway 1: Keep Bunurong Road in current position

- Design a seawall suitable for future (2100+) conditions.
- Include allowance for drainage, including tidal gates.
- Consider height of the existing road, raise the road above future inundation.

Pathway 2: Relocate Bunurong Road

- Design a seawall suitable for short term protection of the road (and services) for the full length.
- Identify erosion trigger levels for when construction works should be undertaken - ensuring that construction does not create multiple disconnected seawalls.
- Assess feasibility of stockpiling rock or geotextile bags to prepare for rapid response to erosion.

Bunurong Road Seawall to Point Norman

Pathway 1: Maintain existing dune and beach amenity for long term planning horizon (2100+)

- Groyne field – constructed to create pocket beaches
- Initial large scale beach renourishment
- Regular renourishment sand management
- Include drainage pathways for Wreck Creek.

Pathway 2: Plan for retreat

- Identify triggers for beach renourishment during retreat planning
- Assess feasibility of annual renourishment and sand management
- Establish contracts and permits to enable rapid response when required

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