Cape to Cape Resilience Project

Resilience Plan Summary



The Cape to Cape Resilience Plan will enable management agencies and communities to proactively manage coastal hazard impacts and increase resilience for coastal areas from Cape Paterson to Cape Liptrap.

Developed over 2 years, stakeholders and communities actively collaborated to create the plan, which provides a roadmap to build resilience across communities and adapt to coastal hazards both now and into the future.

The Resilience Plan aims to:

- Inform future decisions regarding the protection and management of our coast and foreshore
- Inform future land use planning
- Guide management of public utilities / facilities
- Guide the management of areas of environmental and cultural significance
- Safeguard our coastal values and lifestyle
- Foster collaboration and shared care of our coastline.

The plan is a product of the **Inverloch Regional and Strategic Partnership (RaSP).** Established in 2020, the RaSP brings together Traditional Owners and nine agencies with roles in managing the region's coastal and foreshore values, assets and infrastructure.

Approach

The *Marine and Coastal Act 2018*, related Policy, and guiding principles informed development of the plan. The Victoria's Resilient Coast – Adapting for 2100+ framework also provided a staged approach for coastal hazard risk management and adaptation.



Figure 1. Victoria's Resilient Coast - Adapting for 2100+ framework stages.

Developing the Resilience Plan included:

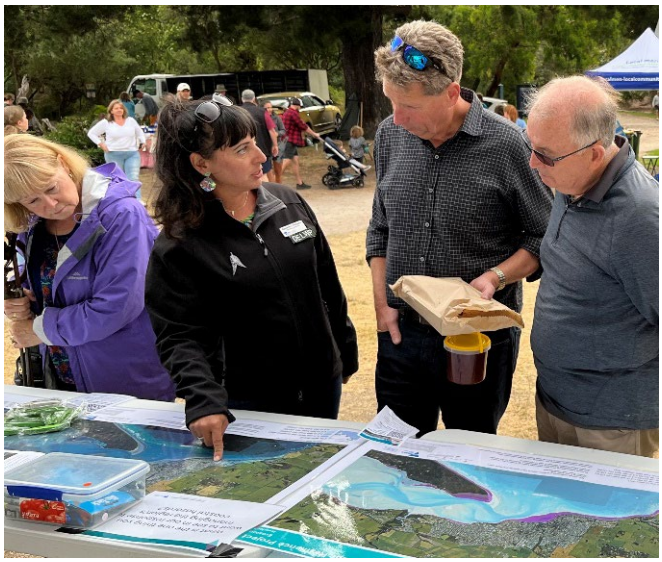
- Understanding **community values and vision** for the future, including cultural values, through extensive engagement.
- Understanding **coastal processes** that have shaped the coastline in the past, and what they may look like in the future.
- Identifying coastal hazard areas through a **Coastal Hazard Assessment (CHA).**
- Understanding **vulnerabilities and risks** to assets, including an **economic base case**.
- **Engaging with the community** to understand the preferred approaches to adaptation.
- **Determining adaptation actions, costs, priorities**, and timeframes for implementation, including action modelling and assessment.
- Coastal **resilience planning and adaptation pathways.**
- Guiding the next stages for **implementation** of actions.

A plan shaped by community values

Community values, partnerships, and engagement form core components of resilience planning under the framework. The development of the plan has focussed around ten key community values:

- Desirable places to live, work, visit and play, including reliable public services, amenities, access
- The ability to live in a coastal community
- Healthy coastal and marine ecosystems
- Natural resilience to coastal hazards and sea-level rise impacts
- Safe and eco-sensitive access to and enjoyment of coastal areas
- Cultural, historic and spiritual connections to the coast
- Abundant and diverse native coastal and marine flora and fauna
- Coastal landscapes, seascapes, character and views
- Clarity, consistency and confidence in foreshore management and responsibilities
- Water quality that is safe and reliable for human consumption, recreational use, healthy ecosystems and primary industry

These values have been embedded in all stages of the technical work, informing plan and action development.



The changing coastal landscape

The coastline between Cape Paterson and Cape Liptrap has formed over millions of years. Tectonic movements, wind and wave energy, catchment runoff, sand movement and varying sea levels have all shaped the coast we see today.

These unique landscapes are valued for their ecosystems and habitats, recreational and social value, culturally significant stories, sites and values, and as a driver for economic development of the region. The proximity to the coast and natural beauty of the region makes it a desirable place to live, work and visit.

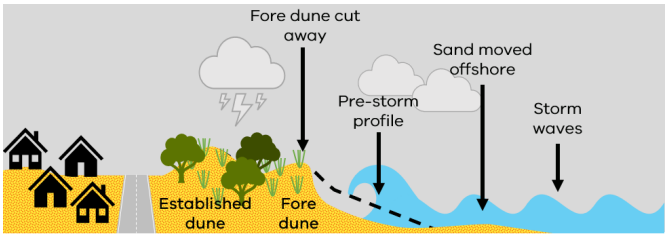
Coastal hazards

When natural coastal processes impact on the things we love and value in coastal areas, they become coastal hazards.

Coastal hazards considered in adaptation planning for the Cape to Cape region include:

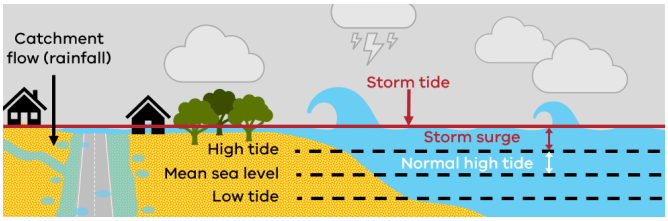
Coastal erosion

Including sand/sediment loss on sandy shores, cliff collapse or slumping



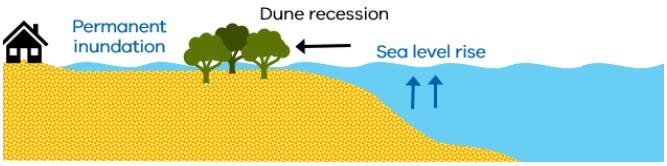
Storm tide inundation

Temporary flooding from the sea and rainfall (catchment)



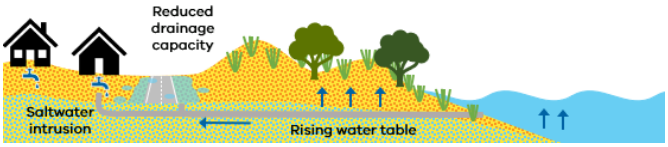
Permanent inundation

Increasing tidal areas



Groundwater intrusion

Rising water tables and increased salinity



We consider these hazards under varying sea level rise conditions into the future:

Sea level rise	Indicative horizon	Description
Mean sea level (MSL)	Present day	Base line
MSL +0.2 m	2040	Short term
MSL +0.5 m	2070	Medium term
MSL +0.8 m	2100	Long term
MSL +1.1 m	2100	Sensitivity scenarios
MSL +1.4 m		

Cape to Cape Resilience Project

Coastal hazard modelling and mapping

New coastal models (computer-based) were developed to estimate current and future erosion, sea level rise and storm tide inundation hazards for the Cape to Cape region.

Aligning with best practice coastal hazard adaptation studies, a series of scenarios were modelled which incorporated a range of:

- Planning horizons (sea level rise scenarios).
- Coastal hazard 'events' (probabilities).
- Urban and catchment (rainfall) flow events.
- Erosion rates (recent, rapid and longer term).

Different combinations of these variables are used to reflect local current and future conditions that may be experienced across the region.

These scenarios are modelled and **coastal hazard extents** are mapped.



Coastal hazard maps. Source: DEECA

Check out the hazard layers at:
mapshare.vic.gov.au/coastkit

Coastal hazard impacts

Once we know the areas likely to be exposed to coastal hazards, we can assess the vulnerabilities and risk for the values, uses and infrastructure in those areas.

We assessed:

Beach and foreshore assets - Access, stairs, boardwalks, protection structures, beaches

Planning scheme - Zones and overlays

Buildings and facilities - Building footprints (public and private), SLSC, amenities, shelters, park and street furniture

Transport infrastructure - Roads, bridges, crossing, paths and trails

Other infrastructure and utilities - Water, sewer, electricity, telecoms, gas pipelines

Land use, environmental and cultural - Dune system, vegetation, habitat, ecosystems, sensitive sites, cultural areas

Extensive spatial analysis was undertaken to assess which assets (or portions of assets) are exposed to the mapped coastal hazard scenarios.

Coastal hazard risk is assessed based on the:

Likelihood (probability/chance) of exposure to coastal hazards

and

Consequence (impact) of exposure

Likelihood is estimated for each hazard scenario that was considered, based on the probability of occurrence.

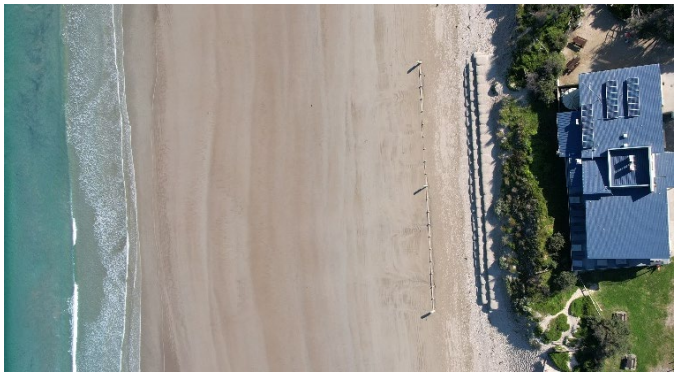
Consequence is determined through a tailored rating of impact. This rating considering community and cultural values, existing risk management approaches, similar assessments nationwide, and RaSP partner input.

Assessing risk and vulnerabilities across the region informs where action may be required to reduce risk to acceptable levels.

Risk	Action required
High	Immediate and/or ongoing action required to treat, eliminate, or reduce risk.
Significant	Short term action required to treat, eliminate, or reduce risk.
Medium	Short to longer term action required to treat, eliminate, or reduce risk.
Low	Manage and monitor the risk as part of current operations, provide for periodic maintenance/review.

The Project also included economic analysis to assess the economic cost of non-intervention (business as usual or doing nothing differently) and a range of case studies to further investigate:

- The value of Inverloch Surf Beach.
- Ecosystem services from blue carbon.
- Access impacts including Cape Paterson-Inverloch Road (Bunurong Road) and Venus Bay-Inverloch Road.



Adapting to coastal hazard risk

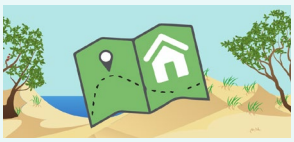
The Marine and Coastal Policy 2020 reframed the management of coastal hazards in Victoria, enabling a sustainable and holistic approach to benefit Victoria's coastline in the long term. Under the policy, adaptation options are considered in order of:

1. Non-intervention



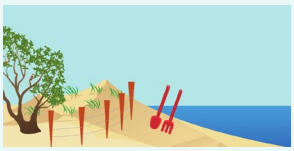
Allow marine and coastal processes, and the hazards they may pose, to occur.

2. Avoid



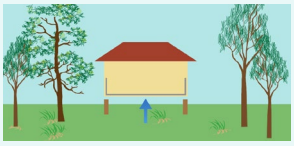
Locate new uses, development and redevelopment away from areas that are or will be negatively impacted by coastal hazards.

3. Nature-based



Enhancing or restoring natural features to mitigate coastal hazard risk. Includes dune and vegetation enhancement and small scale renourishment.

4. Accommodate



Structures can be designed to reduce the exposure to, or decrease the impact of, coastal hazard risk, thus 'accommodating' the risk.

5. Retreat



Existing structures, assets or uses may be decommissioned or relocated away from areas that are, or will be, negatively impacted by coastal hazards.

6. Protect (major engineering)





Existing physical barriers are enhanced, or new ones constructed, to mitigate the impact of coastal hazards. Includes engineered structures (groynes, seawalls, breakwaters) and major dune and beach renourishment.

Assessment of adaptation options has been guided by:

- The Victorian Marine and Coastal Policy
- Appreciation of risk across locations and emerging risk through time
- Economic assessment and case studies
- Detailed coastal modelling of engineering solutions
- Community and stakeholder perspectives

Actions and pathways

Implementing these options includes many adaptation actions. These actions can be broadly classified into:

- **Land management, planning and design**
- **Nature-based**
- **Engineering**

Detailed decisions about the implementation and timing of actions will be made in line with the normal government policy and budget processes.

Adaptation pathways

Adaptation actions are not mutually exclusive. Often, we require a suite of measures to effectively manage coastal hazard risk. Tailored adaptation pathways provide a roadmap of adaptation actions from present day to 2100+. This approach allows us to:

- Plan strategically for the long term.
- Consider multiple potential futures.
- Avoid short-term actions that may lead to poor adaptation outcomes.

Adaptation pathways include:

- Clear action sequencing, providing confidence to take short-term action.
- Lead times required for further investigations, design and approvals.
- Changing feasibility of actions over time.
- Trigger points when a different action is required.



The actions for the Resilience Plan have three themes:

- **Foundational actions**
  Provide strong foundations for strengthening community resilience and success of regional and location-specific initiatives
- **Regional actions**
  have relevance across the whole Cape to Cape region (and potentially beyond)
- **Location-specific actions**
  provide detailed actions for location-specific management. They are dependent on local hazard drivers, values and assets at risk, and environmental processes.

Foundational actions

Foundational actions are about enhancing the adaptive capacity of Cape to Cape stakeholders and communities and the way we respond to emerging hazard risk.

They aim to provide important knowledge, data, skills and tools to enable adaptation approaches to succeed and continue to evolve and adapt to changing conditions. These actions can be integrated with regional and location-specific actions to improve action outcomes.

Foundational actions in the Plan include:

- Actively engaging and empowering the community to build coastal hazard resilience.
- Facilitating knowledge sharing and education on hazards and adaptation.
- Monitoring changes in coastal hazard risk and effectiveness of adaptation.
- Boosting collaborative research opportunities and undertaking additional investigations to support adaptation.
- Investigating mechanisms, seeking and applying for funding to support implementation of the Plan.



Regional actions

Regional actions have relevance across the whole Cape to Cape region (and potentially beyond). Regional actions look to provide a broader process, method or framework via which many location-specific actions can be achieved.

Some regional actions have specific relevance at particular locations. Implementation of these regional actions helps to coordinate and drive more specific, location-based actions.

Regional actions in the Plan include:

- Planning updates to avoid current and future risk, including land use and emergency response planning
- Dune, vegetation and ecosystem management and enhancement.
- Small-scale, moving to larger scale dune and beach renourishment including identifying sand sources and triggers for nourishment.
- Identifying blue carbon opportunities that could enhance ecosystem services.
- Planned management approach for culturally significant sites and places.
- Redesign and upgrades of infrastructure, including road and utility network and building resilience of private assets.
- Developing an approach to planned relocation of both public and private built assets and transition of land uses.
- Regional maintenance of coastal protection structures and investigation to support large-scale sand sourcing and nourishment.

Location-specific actions

The Cape to Cape study area has been divided into four reporting regions:

1. **Cape Paterson-Inverloch Road (Bunurong Road)**
2. **Inverloch Surf Beach**
3. **Inverloch (within Anderson Inlet)**
4. **Venus Bay and Tarwin Lower**

In addition to the foundational and regional actions, different locations require site-specific adaptation responses to manage localised risk.

Providing location-specific management, these actions are dependent on local hazard drivers (i.e. erosion or inundation), values and assets at risk, and environmental processes.

Cape Paterson-Inverloch Road (Bunurong Road)

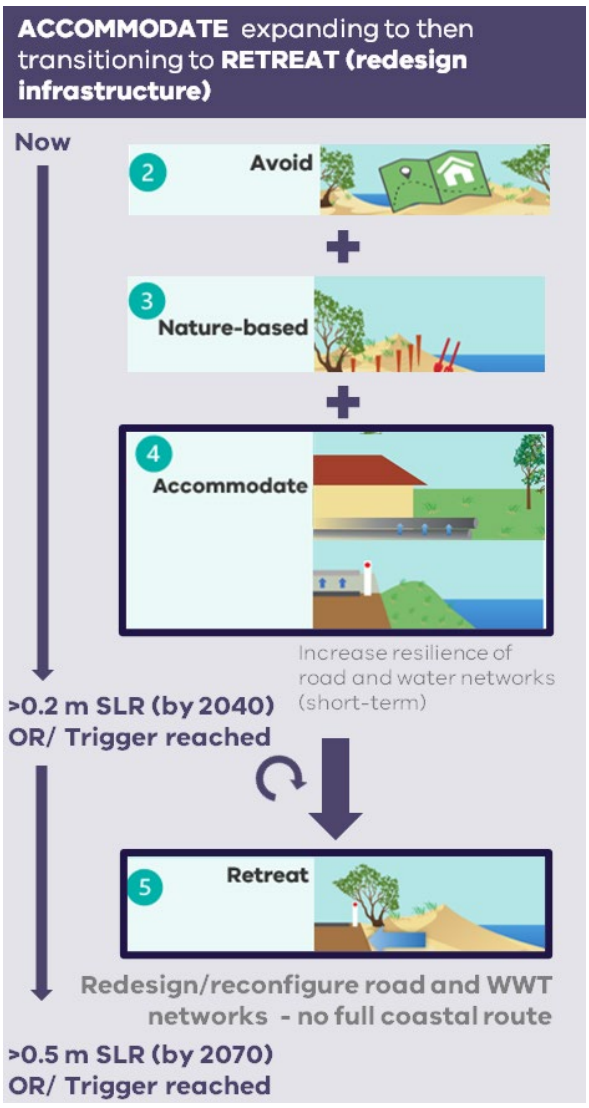
Cape Paterson-Inverloch Road is the primary thoroughfare connecting the Inverloch and Cape Paterson townships. The road is an important asset providing scenic views of the sandy coves, rock platforms and cliffs, and access to pocket beaches for visitors to explore. Many utilities and services also run along the road. This region will be impacted by erosion and storm tide inundation, with exposure and risk likely to increase into the future.

Cape Paterson-Inverloch Road (Bunurong Road) coastal hazard risk profile:

SLR	0.0 m	0.2 m	0.5 m	0.8 m
Indicative time	Present	2040	2070	2100
Erosion	Med*	Med	Sign*	Sign
Storm tide	Med*	Med*	Med	Med
Permanent inundation	Low	Low	Low	Low

*At some locations within the reporting area.

The preferred pathway for Cape Paterson-Inverloch Road involves accommodating risk, then retreating into the future.*





Considerations for this pathway include:

- Retains sandy beach and natural amenity – good alignment with community values.
- Requires retreat mechanism/strategy development.
- Maintains localised access to key assets and attractions.
- No longer a full coastal route from Inverloch to Cape Paterson, but potential opportunity for cycling or walking trails in transition periods.
- Adaptation approach must integrate works for road and wastewater networks.

Immediate actions to implement this pathway include:

- Developing a targeted retreat response. Includes triggers and approach for utilities, roads, wastewater services and private properties.
- Minimising dune disturbance and enhancing vegetation and habitat connectivity through allowing space for ecosystem transition.
- Utilising nature-based approaches to recognise and protect cultural values and heritage sites.
- Reviewing at-risk infrastructure and embedding coastal risk information in asset management.
- Upgrading key assets to accommodate risk in the short term, while a retreat approach is developed.
- Maintaining existing coastal hazard protection structures, while retreat approach is developed.

Inverloch Surf Beach

Renowned for its natural amenities and coastal seascapes, Inverloch Surf Beach is a major tourist destination, drawing in beach users, avid surfers and holidaymakers during peak summer seasons. It supports a range of recreational values such as swimming, surfing, boogie boarding, relaxing, walking and bird watching.

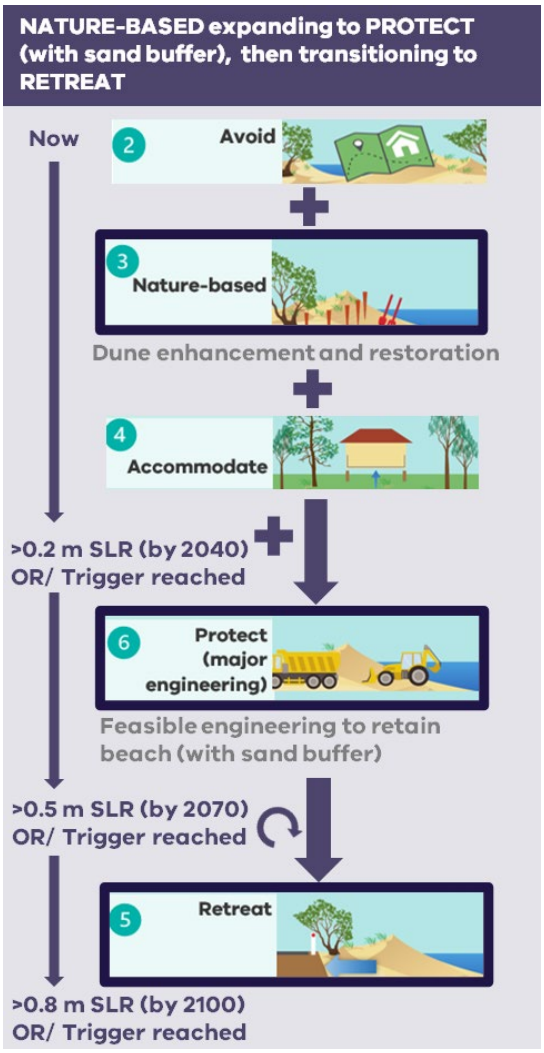
The Surf Beach is exposed to high energy open ocean south-westerly and south-easterly swells originating from Bass Strait. This region will be impacted by erosion and storm tide inundation. These combined hazards mean risk is likely to increase significantly.

Inverloch Surf Beach coastal hazard risk profile:

SLR	0.0 m	0.2 m	0.5 m	0.8 m
Indicative time	Present	2040	2070	2100
Erosion	Med*	Med*	Sign*	High
Storm tide	Low	Med*	Med	Med
Permanent inundation	Low	Low	Low	Low

*At some locations within the reporting area.

The preferred pathway involves nature-based methods, then protection through sand buffers, then retreating into the future in some locations.*



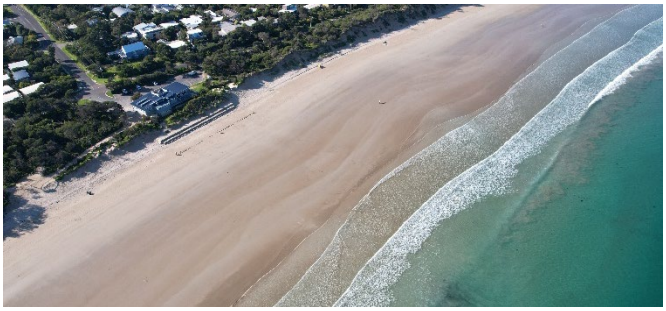


Considerations for this pathway include:

- Allows community to retain a sandy beach and natural amenity for as long as possible.
- Requires retreat mechanism / strategy development.
- Allows natural processes and retains natural setting and appeal of the Surf Beach.
- Less impacts on surrounding marine and coastal environments by not using large, engineered structures.

Immediate actions to implement this pathway include:

- Developing a targeted retreat response. Includes triggers and approach for surf life saving club, utilities, roads, and private properties.
- Minimising dune disturbance and enhancing vegetation and habitat connectivity through allowing space for ecosystem transition.
- Medium-scale, moving to larger scale sand renourishment to enhance dunes and protect infrastructure (roads, SLSC, assets).
- Utilising nature-based approaches to recognise and protect cultural values and heritage sites.
- Reviewing at-risk infrastructure and embedding coastal risk information in asset management.
- Investigating waterway dynamics and drainage options at Wreck Creek to manage flooding risk.
- Maintaining existing coastal hazard protection structures (geobag wall) in the short term, while retreat approach is developed.



Inverloch township (within Anderson Inlet)

The Inverloch township is situated within Anderson Inlet, Victoria's largest open barrier estuary. The landscape across the Inlet varies and encompasses sand beaches, engineered coasts, mangrove and saltmarsh communities. The area is valued for varied recreational beach and water activities.

This region will primarily be impacted by storm tide and permanent inundation, with small areas of the foreshore also likely to be impacted by erosion. Channel migration will likely drive some erosion inside the inlet.

Inverloch township coastal hazard risk profile:

SLR	0.0 m	0.2 m	0.5 m	0.8 m
Indicative time	Present	2040	2070	2100
Erosion	Med*	Med*	Med*	Sign
Storm tide	Low	Med*	Med	Med
Permanent inundation	Low	Med*	Med*	Sign*

*At some locations within the reporting area.

The preferred pathways are split into:

- Natural areas within Anderson Inlet (including creeks)
- Holiday Parks / foreshore camping area
- Pymble Avenue picnic/barbecue area, dog beach.



Considerations for these pathways include:

- Retains natural setting and increases natural buffer / resilience by making space for nature– good alignment with community values.
- Avoids future risk through improved planning and development controls that consider coastal hazards.
- Requires retreat mechanism/strategy development.
- Maintains local facilities (picnic areas and holiday parks) for as long as possible.
- Adaptation approach must integrate works for road, utility networks, holiday parks and private properties.

Preferred pathways for Inverloch township (within Anderson Inlet):



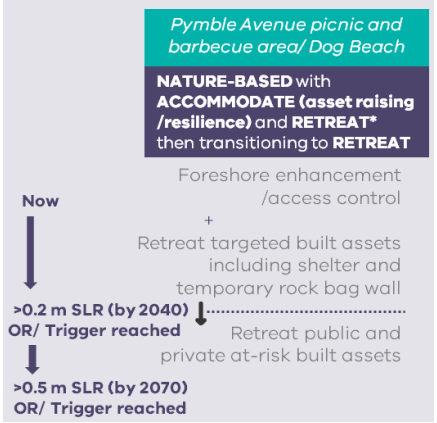
Immediate actions to implement these pathways include:

- Enhancing ecosystem connectivity and allowing transition by making space for nature. Includes coastal wetland areas and Ayr, Screw and Pound creeks.
- Facilitating saltmarsh and mangrove protection and enhancement.
- Developing long-term plan for transition of rural areas at risk of inundation to wetland ecosystems.



Immediate actions to implement these pathways include:

- Establishing a continuous vegetation buffer and minimising foreshore disturbance through formal access points, controls and fencing.
- Upgrading key assets (including roads and utilities) to accommodate risk in the short term, while a retreat approach is developed.
- Advocating/promoting resilient home upgrades and design for private properties, the Holiday Park and foreshore camping built assets.
- Developing a planned retreat response for the Holiday Park / foreshore camping and its services. Includes triggers, approvals and funding.



Immediate actions to implement these pathways include:

- Establishing a continuous vegetation buffer and minimising foreshore disturbance through formal access points, controls and fencing.
- Upgrading key assets (including roads, utilities and boat ramp) to accommodate risk in the short term, while a retreat approach is developed.
- Developing a planned retreat response for the temporary rock bag wall, timber seawall and at risk assts (including roads and utilities). Includes triggers, approvals and funding.

Venus Bay and Tarwin Lower

The region supports extensive freshwater, estuarine and coastal habitats across Anderson Inlet and the Tarwin River. This region also covers the large dune barrier system along Venus Bay and Cape Liptrap Coastal Park. The natural environment is a big drawcard for living in these communities.

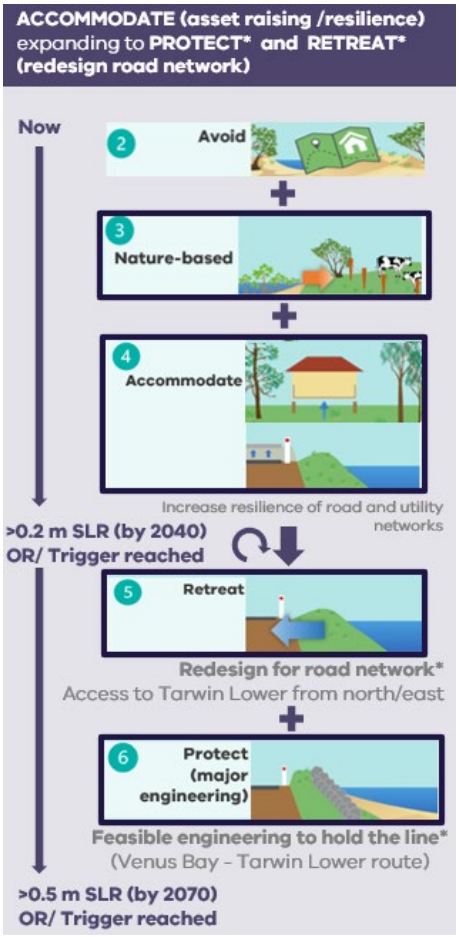
The area is exposed to inundation hazards, with risk likely to increase into the future. Erosion is likely to impact the open coast dunes/beaches (which provide some natural buffer) and small areas of Inlet coastline.

Farmland and saltmarsh areas surrounding Anderson Inlet are likely to be more regularly or permanently inundated. Some estuarine vegetation communities have capacity to naturally migrate inland, where physical barriers (levees, roads) do not limit migration.

Venus Bay and Tarwin Lower coastal hazard risk profile:

SLR	0.0 m	0.2 m	0.5 m	0.8 m
Indicative time	Present	2040	2070	2100
Erosion	Low	Low	Med	Med
Storm tide	Med	Med	Sign	Sign
Permanent inundation	Med	Med	Sign	Sign

The preferred pathway involves nature-based methods and accommodating risk, with some protection, then retreating in some locations, in the future.



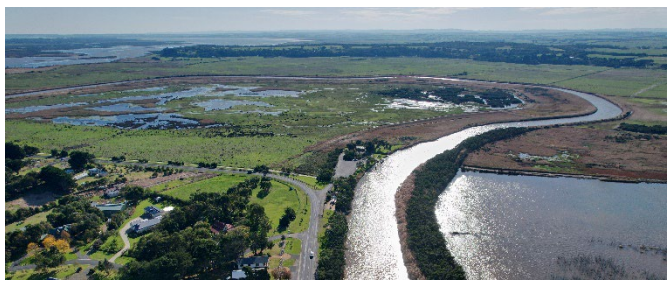


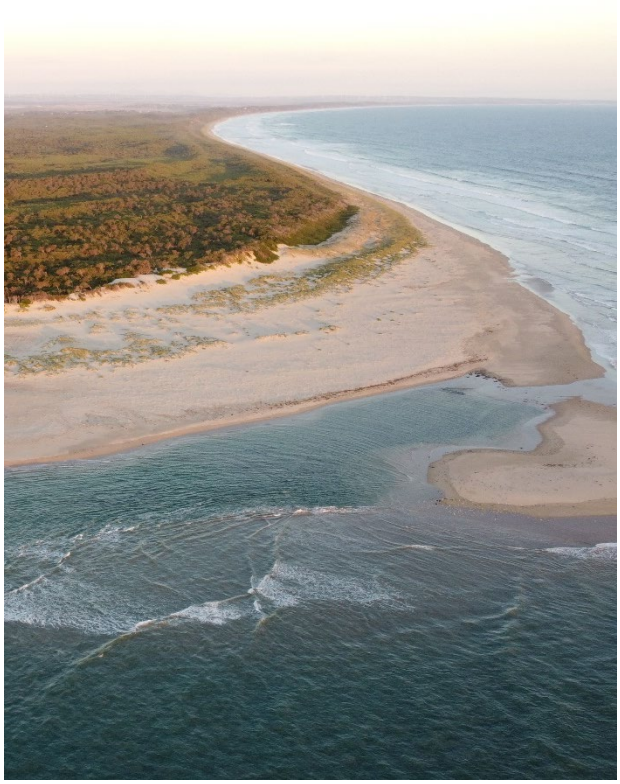
Considerations for this pathway include:

- Allows natural migration of important coastal and estuarine ecosystems
- Requires further planning and investigations for road network and options for raising, protecting or rerouting the road.
- Maintains access to coastal communities for as long as possible.

Immediate actions to implement this pathway include:

- Minimising dune disturbance and enhancing saltmarsh and mangrove habitat connectivity through allowing space for ecosystem transition.
- Accommodating risk through road and utility upgrades to allow services to continue.
- Developing a tailored planned retreat approach for inundation-prone private assets (land and built).
- Developing a targeted retreat response (including triggers and approach) to redesign the Inverloch-Venus Bay Road network (north of Tarwin Lower).
- Undertaking additional flooding assessments across Anderson Inlet and the Tarwin River to determine potential action impacts on hydrology.
- Protecting road access through a raised road and armoured levee for Inverloch-Venus Bay Road (between Tarwin Lower and Venus Bay).





Implementing the Plan

The Cape to Cape Resilience Plan will be implemented through a range of mechanisms including:

- An effective Monitoring, Evaluation, Reporting and Improvement (MERI) approach, to enable adaptive management and continual learning and improvement.
- Embedding outcomes and actions from the Resilience Plan into existing processes and activities of each RaSP agency.
- Implementing new initiatives from the Resilience Plan.
- Collaborating and coordinating with RaSP members on action delivery.
- Collaborating with State Government and advocating for collaborative delivery of actions and policy to support action delivery.

An Implementation Plan has been developed in collaboration with the RaSP agencies. Outlining the operational application of the Resilience Plan, it provides detail on the responsible, delivery and supporting partners for each action.

Detailed decisions about the implementation and timing of actions will be made in line with the normal government policy and budget processes.

Monitoring, evaluation, reporting and improvement

Monitoring will include both monitoring of physical changes on the coast and plan implementation. This might include funds expended, actions implemented, levels of engagement or benefits/outcomes delivered.

Evaluation of the Plan will consider its impact, effectiveness, appropriateness, efficiency and legacy. Evaluation metrics, which may be based on monitoring data, will be used to evaluate the plan and may trigger a review.

Reporting on overarching Plan implementation will be DEECA's responsibility. This includes annual reporting on the Resilience Plan actions and other reporting metrics. Individual organisations will report on actions through their own internal processes.

Improvement of the Plan will be undertaken through a review every 5 years or when a review trigger occurs. This review will consider the successes of the Plan implementation and opportunities for improvement. This review may be in response to changing physical conditions, changes in policy, new information/data and/or changes to stakeholders and community governance and perceptions/tolerance of risk.

Next steps

This Resilience Plan represents the start of an ongoing process of planned adaptation over time. All stakeholders and community members, including residents, visitors, and workers in the region, share the responsibility of adapting to coastal hazards.

This Plan marks the initial stage of an ongoing process of planned adaptation. Adaptation pathways will be continuously refined, updated, and implemented as new information, knowledge, and community aspirations emerge.

Adaptation pathways will be continually informed by stakeholder and community input and ideas, new knowledge and monitoring the effectiveness of actions.





We acknowledge Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and commit to genuinely partnering with them and Victoria's Aboriginal community to progress their aspirations.



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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.

Inverloch Region Coastal Hazard Assessment

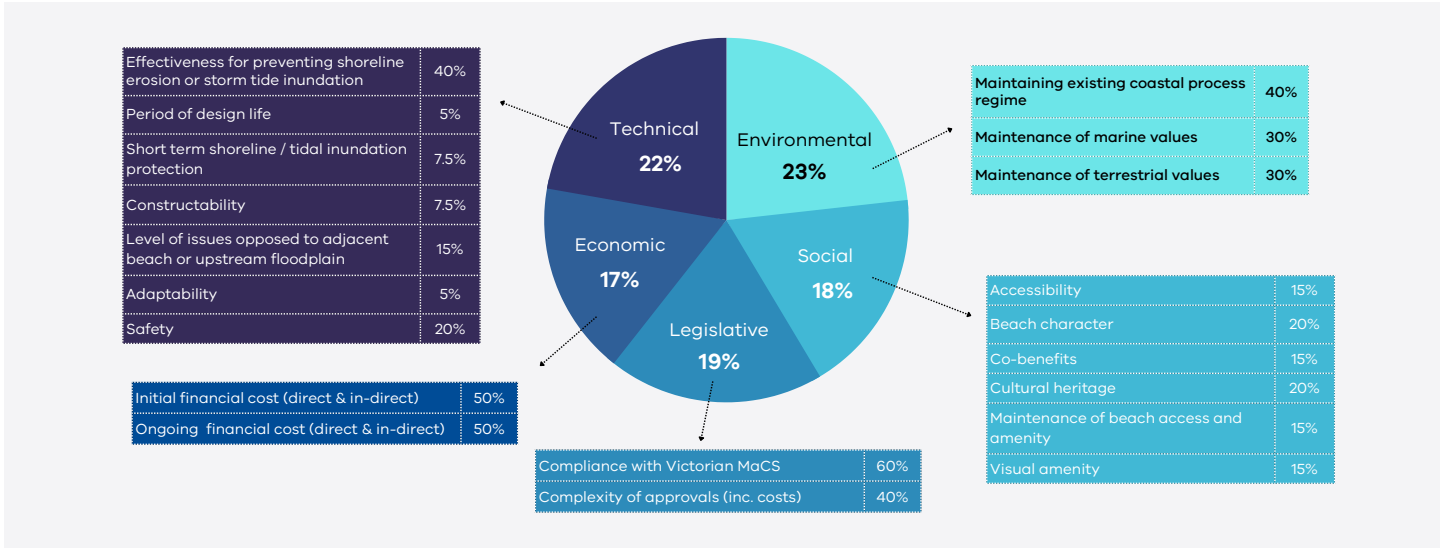


Figure 2. Image showing the multi criteria analysis (MCA) theme weighting

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.

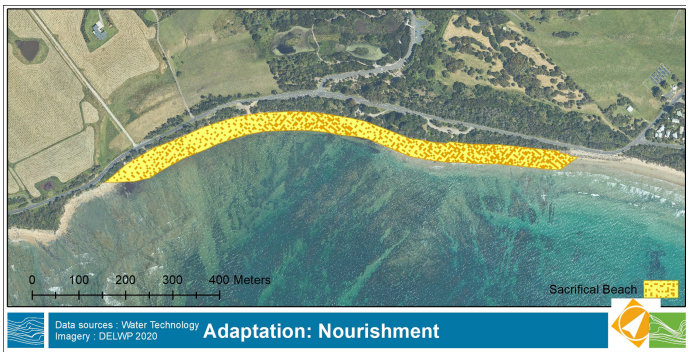


Figure 3. Conceptual extent of sacrificial beach nourishment

Positives

- 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

Negatives

- 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

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

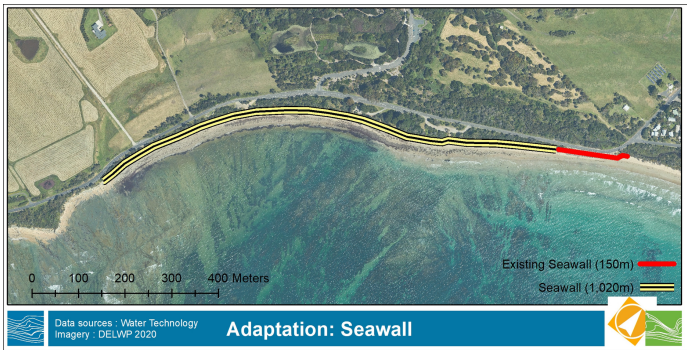


Figure 4. Conceptual design - Bunurong Rd Seawall at Flat Rocks

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

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

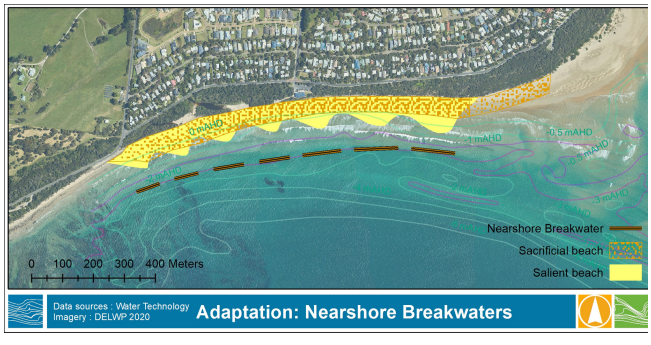


Figure 6. Nearshore breakwaters concept design

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

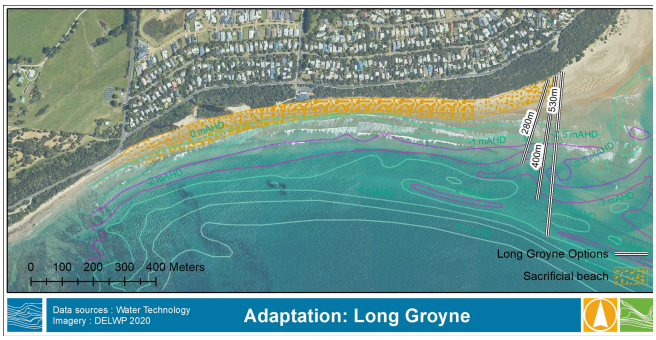


Figure 7. Conceptual design - Long groyne at Point Norman

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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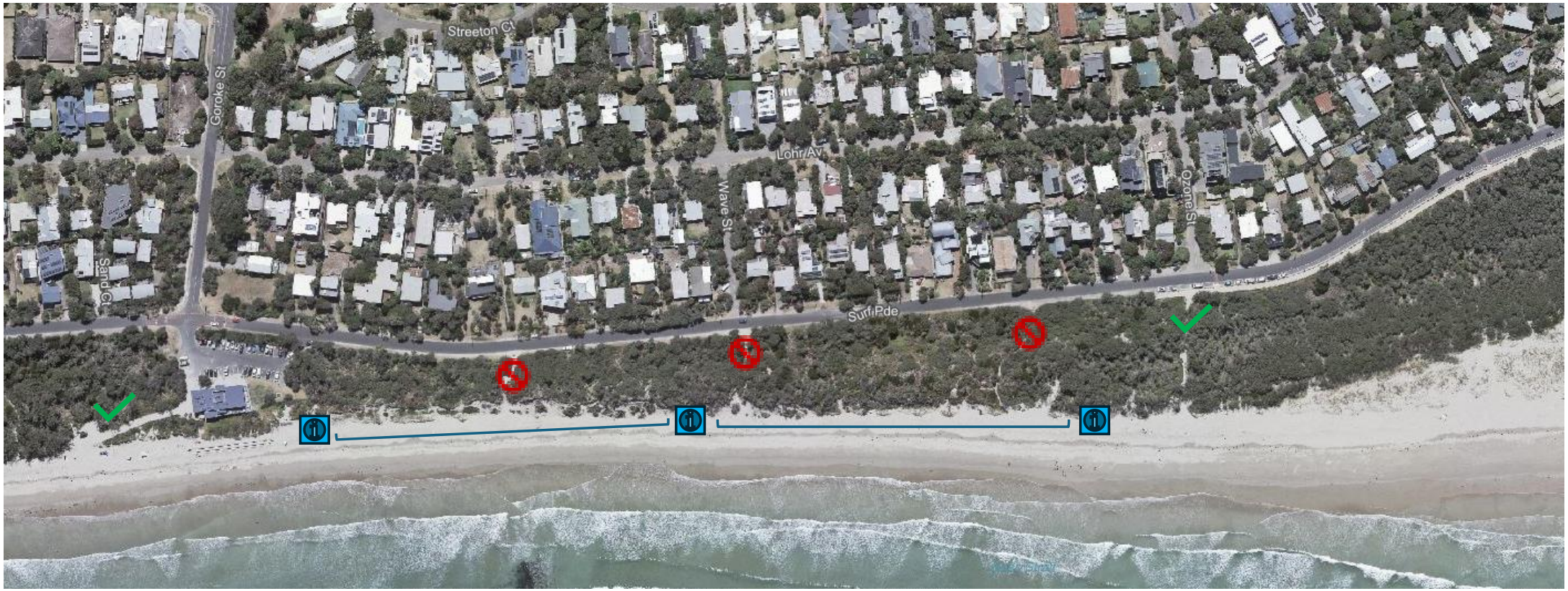
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Summary of Temporary Track Closures
Inverloch Surf Beach - Summer 2024-25

Based on site inspections and community feedback, three beach access tracks between Goroke St and Ozone St will be closed for the 24/25 summer.

Erosion of the dune has resulted in unstable vertical sand-cliffs of approx. 4-5m in height. Maintaining safe beach access in these conditions is not feasible. Tracks to be reopened as conditions allow.

- Track Closed – signage and temporary fencing to be installed
- Track Open – update to general signage highlighting beach conditions
- On-beach signage/bunting: *Keep Out – Unstable Dunes & Vegetation*