

Gisborne District Council

WAINUI COASTAL ADAPTATION PROGRAMME ADAPTATION PATHWAY PLANNING

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CONFIDENTIAL



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Gisborne District Council

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This report ('Wainui Coastal Adaptation Pathway Planning') has been prepared by WSP exclusively for Gisborne District Council ('Client') in relation to Wainui Coastal Adaptation Pathway Planning ('Purpose') and in accordance with Statement of Work Supplier Panel Document dated 04/04/2023. The findings in this Report are based on and are subject to the assumptions specified in the Coastal Adaptation Pathway Planning. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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GLOSSARY

Adaptation	The process taken to adjust to the impacts and risks of coastal inundation
Adaptation approaches and options	Compendium of four approaches to physical climate change adaptation and resilience measures relevant for coastal hazards, which can help to support the council and community to address climate change impacts.
Climate Change	Large-scale, long-term shifts in the planets weather patterns and average temperatures
Climate change impacts	The consequences of climate change, both experienced and expected, for natural and human systems and environments.
Resilience	Capacity to prepare for, respond to, and recover from climate impacts and risks while incurring minimal damage to wellbeing, the economy, and the environment
Trigger	A point in time that allows any change that occurs to be monitored and to have a point on which to adapt. Triggers highlight impending changes in risk.

ABBREVIATIONS

GDC	Gisborne District Council
SLR	Sea Level Rise
CAP	Coastal Adaptation Plan
NAP	National Adaptation Plan
MfE	Ministry for the Environment
BAU	Business as Usual

1 INTRODUCTION

WSP has been engaged by Gisborne District Council (GDC) to develop a Coastal Adaptation Plan (CAP) for the Wainui Beach coastline. Adaptation planning is about preparing now for the effects of coastal hazards on the Wainui community, infrastructure and environment so that GDC and the community are ready for potential impacts of coastal hazard on the beach.

GDC are responsible for managing risks posed by coastal hazards and for managing the risk to Council owned assets, on behalf of their communities. The Council does not have the explicit legal obligation to protect privately owned assets from coastal hazards, however, historically the roles and responsibilities of Council and private landowners associated with coastal hazard management along the Wainui Beach coastline has been complex.

The roles and responsibilities in regard to coastal protection structures have not been clearly defined. In some sections along the beach there are Council built and maintained structures built into private land and alongside private structures which has resulted in combined efforts from both the Council and the landowners to protect assets from coastal hazards.

1.1 WHAT THE COASTAL ADAPTATION PLAN COVERS

The CAP's aim is to provide a sustainable framework for coastal hazard and risk management, to address the hazards and the risk these pose under current day and future climate scenarios. Following national guidance and given the uncertainty around the impact of future hazards, a trigger-based adaptation approach has been prescribed. The CAP is made up of the six key components outlined in Table 1-1 below.

Table 1-1: Six key components of work that will form the Coastal Adaptation Plan

	Key Components of CAP
1	Hazard Assessment and Report - Wainui Beach Coastal Hazard Assessment Report (WSP, 2023)
2	Vulnerability and risk assessment - Wainui Beach Coastal Risk Assessment Report (WSP, 2024)
3	Values and objectives report (Follow engagement)
4	Options and pathways evaluation (this report)
5	Adaptive planning – triggers and signals
6	Final report and implementation plan.

COASTAL HAZARD ASSESSMENT

The first component of the CAP included a high-level hazard assessment which focused on quantifying the short and long-term historical shoreline changes using beach monitoring data and

aerial imagery, the potential future shoreline erosion, and the inundation hazard under current and future climate scenarios.

The outputs from the hazard assessment and the methodology adopted to conduct the assessment are presented in the 'Wainui Beach Coastal Hazard Assessment Report' (WSP, 2023). This analysis identified a range of hazard zones corresponding to differing likelihoods of occurrence which will be applied to this risk-based assessment.

VULNERABILITY AND RISK ASSESSMENT

The second component of the CAP included a risk-based assessment to understand the exposure of key assets and infrastructure along the Wainui Beach coastline to coastal hazards under current and future climate scenarios. The risk assessment used the inundation and erosion hazard information from the first component of the CAP (WSP, 2023) and additional information (Cliff/slope instability and fluvial and pluvial flooding), taken from GDC's Tairāwhiti Online GIS viewer (Tairāwhiti Maps).

The risk assessment enabled GDC to understand Wainui Beach's vulnerability to coastal hazards. The progressive increase in sea level rise over time will exacerbate the vulnerability of the coastline and therefore it was important to understand the areas of Wainui Beach that are most vulnerable to inform the prioritisation of adaptation pathway planning.

OPTIONS AND PATHWAYS EVALUATION (THIS REPORT)

This report details the adaptation pathway planning options for the most vulnerable areas of each section along the Wainui Beach coastline to the identified coastal hazards (Figure 1-1). Using the information from the 'Wainui Beach Coastal Hazard Assessment Report' (WSP, 2023) and the 'Wainui Beach Coastal Risk Assessment' (WSP, 2024) outputs from this plan will include the identification of potential climate change adaptation and resilience pathways over the short-term (5 to 20 years), medium-term (20 to 50 years) and long-term (more than 50 years) timeframes.

Preliminary indicative triggers will also be identified, however these triggers will be further refined following community engagement, once preferred adaptation pathways and options are confirmed.

The information compiled within this document is intended to provide GDC with guidance on feasible adaptation options and decision making for specific sections of the coastline with respect to rising sea levels associated with future climate change. The outputs from this analysis will also support GDC's conversations and engagement with the community. This information will then be incorporated into the final adaptation and implementation plans. These will include agreed thresholds and triggers.

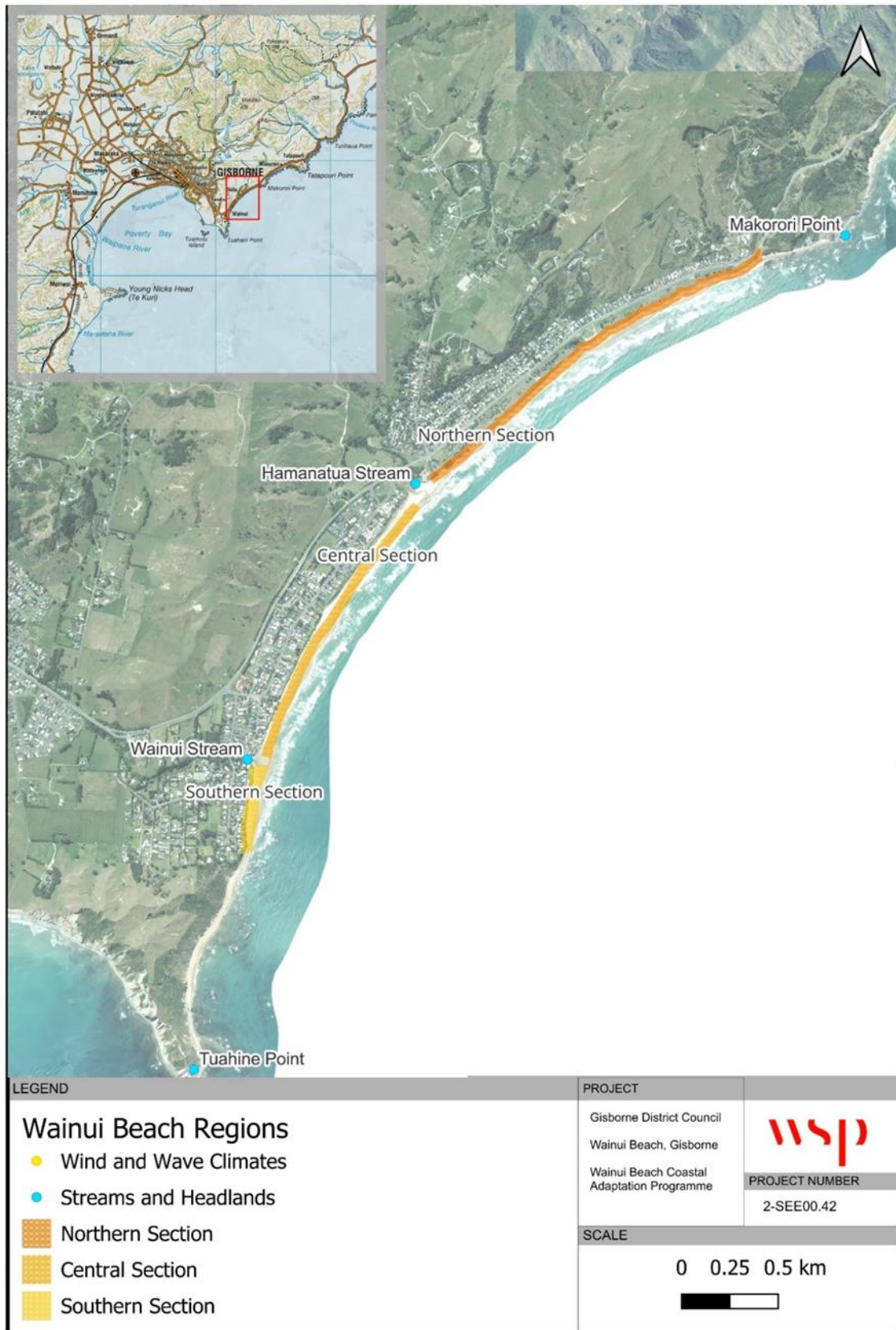


Figure 1-1 Wainui Beach overview of coastal sections

1.2 SUMMARY OF WAINUI BEACH HAZARDS AND RISK

The Southern and Central Sections of the coastline are the areas most vulnerable to coastal hazards. The assets in these sections are most at risk to the coastal erosion hazard under current and future climates. Several buildings, roads and carparks are likely to be at risk under current climate and this incrementally increases over 100 years under the SSP5-8.5+VLM SLR scenario.

Coastal storm inundation and SLR will have the most significant impacts on coastal assets (e.g. public and private stairs and coastal protection structures) simply because of the nature of their purpose and location (adjacent to the sea) and to low-lying sections of the coastline around stream mouths.

A summary of hazard and risk for each beach section is provided below.

SOUTHERN BEACH SECTION

The most significant coastal hazard for this section of coastline are risks associated with coastal erosion hazards. The historic rate of erosion along the Southern Section of the beach ranges between -0.04m/y and 0.11m/yr. The erosion potential of the Southern Section of the beach in 100 years ranges between 45.5m and 80.1m based on different SLR scenarios. The assets most at risk to coastal hazards along this section are buildings, private and public stairs, stormwater infrastructure and roads.

WAINUI STREAM AND HAMANATUA STREAM

The most significant hazard for these river mouth sections of coastline are the risks associated with inundation and coastal erosion. The Wainui Stream has a long-term erosion rate of -0.11m/yr and an erosion potential of 10m in 100 years based on different SLR scenarios. The Hamanatua Stream has a long-term erosion rate of -0.37m/yr and an erosion potential of 10m in 100 years based on different SLR scenarios. The assets most at risk along the Wainui Stream mouth are buildings and roads. The assets most at risk to along the Hamanatua Stream mouth are the Surf Lifesaving Club and public carparks.

CENTRAL BEACH SECTION

The most significant hazard for this section of coastline are the risks associated with coastal erosion hazards. The historic rate of erosion along the central section of the beach varies, where some profiles of the section show neutral to minor erosion trends. The most significant historical erosion trend within the Central Sections ranges from -0.18m/yr up to -0.29m/yr. The erosion potential of the Central Section of the beach in 100 years ranges between 69.7m and 99.6m based on different SLR scenarios. The assets most at risk to coastal hazards along this section are buildings, roads private and public stairs and recreation reserves.

NORTHERN BEACH SECTION

The most significant hazard for this section of coastline are the risks associated with coastal erosion hazards. The historic rate of erosion along this section of beach varies, where some profiles of the section show neutral to minor erosion trends (southern-most profiles), some sections with erosion rates between of -0.07m/yr and -0.18m/yr and other sections that show minor accretionary trends. The erosion potential of the Northern Section of the beach in 100 years ranges between 6.63m and 11.2m from the top of dune based on different SLR scenarios and on changes in dune and beach topography within this section of beach.

The assets most at risk to coastal hazards along this section are carparks, public stairs, the Surf Lifesaving Club and recreation reserves. Based on observations by WSP coastal experts there is also existing erosion of the dune adjacent to Pines Carpark due to the current stormwater drainage to a concentrated outlet point on the dune.

2 RANGE OF ADAPTATION OPTIONS

The National Adaptation Plan (NAP) (Ministry for the Environment (MfE), 2022) highlighted that the successful adaptation to the impacts of coastal hazards will be vital to the future health and wellbeing of the communities. The NAP suggests that councils and communities should consider the full range of adaptation approaches for areas at risk to coastal hazards.

To inform and add value to the current and future coastal adaptation pathways for the Wainui Beach Coastline, WSP has collated a long list of adaptation and resilience measures for consideration for the Wainui Beach coastline. The long list sets out physical climate change adaptation and resilience measures relevant for coastal hazards, which can help to support GDC and the community address the climate change impacts on coastal hazards.

The options that can be used to adapt to coastal hazards are grouped into five different approaches, that follow the PARA framework. These approaches include a

- Do-nothing approach,
- Protecting assets from the risk,
- Avoiding the risk,
- Retreating from the risk, and,

Within each type of approach, there are a range of potential management options which can vary over temporal and spatial scales. To achieve the best outcomes, it is likely that a combination of types and their associated options will need to be implemented over time as circumstances change.

The five approaches within the compendium are listed below and contain 12 physical measures in total. These categories and measures have been developed from existing good practice technical guidance and an understanding of the most relevant measures for Wainui Beach.

- | | |
|--|---|
| • Do nothing/Business as Usual (BAU) measures: | 3 |
| • Protect measures: | 3 |
| • Avoid measures: | 1 |
| • Retreat measures: | 2 |
| • Accommodate measures: | 4 |

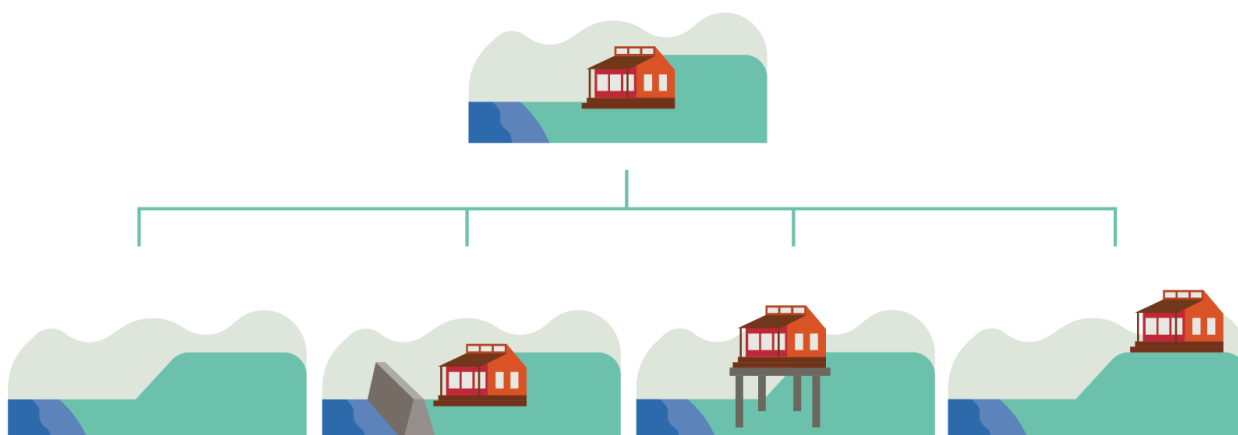


Figure 2-1: Adaptation approaches outline in National Adaptation Plan (Adapted from Figure 7 of MfE, 2022)

2.1 DO NOTHING/BUSINESS AS USUAL (BAU)

The Do Nothing/Business as Usual approach intends that all current coastal hazard management activities continue. Continue to live in an area and use it by maintaining existing infrastructure, continuing current levels of emergency management and environmental monitoring to maintain existing level of service, but with no upgrades to current defences in assets. There are provisions within the Tairāwhiti Resource Management Plan (TRMP) that discourage intensification & increasing of risk profiles within the hazard zone. However, there is still activity taking place which is raising the risk profiles within the hazard zone.

Ultimately should a BAU approach continue there will likely be a market driven response as the impacts of hazards are realised (e.g. Insurance driven retreat). This may lead to a poorer inequitable response across the beach as it will not be structured to allow for full consideration of outcomes and implications. A poorer & inequitable reactionary type response may well lead to poor environmental outcomes across the beach beyond areas being immediately impacted.

This approach intends to continue to use the land as if the vulnerability of coastal hazards is absent or low and any infrastructure and buildings are not threatened by the coastal hazard. This approach may be applicable in the short-term at sections where the current coastal hazard is low.

MAINTAIN CURRENT INFRASTRUCTURE

 <u>Definition</u> Current infrastructure such as buildings, coastal protection	<u>Advantages</u> Restores present day level of service. Reduces health and safety risks. Easily implemented.	<u>Wainui Beach Specific Notes</u> It is recognised that many of the existing structures along Wainui Beach are already significantly deteriorated. Existing maintenance fails to allow the structures to provide the level of service they are intended to provide and instead increases the health and safety risk.
	<u>Disadvantages</u> Does not reduce the risk directly. Continuing to rebuild to the present-day standard in vulnerable locations &	

structures, wastewater, stormwater and drinking water infrastructure, telecommunications infrastructure, and roads and carparks will be maintained to present day level of service, where reasonably possible. This involves repairs of protection structures and stairs when failure occurs however continuing to maintain the present-day level of service.	hazard zones is associated with higher costs long term and uncertainty in relation to the efficacy in a changing climate. This option only provides for the current level of service (protection) and this needs to be considered against existing use and amenity vs. setting expectations for future use.	
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CONTINUE EMERGENCY MANAGEMENT

 <u>Definition</u> Emergency management, including the review of hazard maps, evacuation plans, civil defence emergency management, and temporary accommodation and protection measures.	<u>Advantages</u> Improves community awareness and understanding of hazards. Increases community resilience. Easily implemented.	<u>Wainui Beach Specific Notes</u> Existing Emergency Management that GDC undertake. Going forward it is recommended that GDC set up a prioritising response plan with defined levels of importance that can be easily followed and provides targeted & tiered emergency management response. An example of prioritised risks is as below. 1. Loss of life 2. Loss of connectivity & lifelines 3. Environmental concern 4. Private residence 5. Low value infrastructure¹.
	<u>Disadvantages</u> Does not reduce the risk directly.	

¹ Low value infrastructure refers to park benches, carparks public stairs etc.

CONTINUE ENVIRONMENTAL MONITORING

 <u>Definition</u> This involves systematic observations and measurements at standard intervals and locations, which will help in understanding how the coastline is changing. This may include topographic and bathymetric surveys, shoreline mapping, ecological surveys, structural assessments, and morphological change assessments.	<u>Advantages</u> Helps understand past and current conditions and how the environments are changing to help us plan for future climate change. Easily implemented.	<u>Wainui Beach Specific Notes</u> Existing beach monitoring that GDC undertake.
	<u>Disadvantages</u> Does not reduce the risk directly.	

2.2 AVOID

In the Wainui context, the Avoid approach aims to avoid any further coastal hazards from being created but does not address the already existing hazards. To implement this approach, policy around development & zoning needs to be implemented that prohibits further intensification of risks within the coastal hazard zones and prevents new risks from being created.

COASTAL PLANNING & HAZARD ZONING

<u>Definition</u> Coastal planning & hazard zones include objectives, policies and rules & determined hazard envelopes along the coastline that govern what activities the councils will allow, control or prohibit in the coastal environment.	<u>Advantages</u> Prevents further intensification and development in areas subject to impacts from hazards (to a prescribed degree) and therefore limiting the risk profile. No physical works required.	<u>Wainui Beach Specific Notes</u> Prior planning has allowed for dwellings & infrastructure to be developed within the hazard zone. However, these measures could be employed to discourage further development with the hazard zones and thus reducing the future risks.
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Implementing policies such as down-zoning can help to prevent intensification and exclude areas from further development or redevelopment. Creating rules to limit specified activities in already identified hazard zones helps to ensure development occurs only in accordance with a consenting process.	<u>Disadvantages</u> Does not reduce the current risk directly. The process of drafting & implementing the planning changes can involve a lot of consultation & can be a multifaceted application.	
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2.3 ACCOMMODATE

The Accommodate approach aims to live with the existing coastal hazard. Continuing to use the land parcel in an area but increasing or raising the tolerance of infrastructure, assets and buildings to coastal hazards. This includes maintaining existing structures and assets to current levels of service now and into the future. This approach can avoid or delay the need to remove or relocate at risk assets in the short to medium term.

MINOR INFRASTRUCTURE AND NATURAL DEFENCE ALTERATIONS

 <u>Definition</u> Involves major works to structures and buildings such as maintaining existing coastal protection structures levels of service, through upgrading or replacing with modern engineering practice. For example, inundation & flood proofing (membranes and sealants), raising service equipment (heating, ventilation, air conditioning, plumbing appliances, raising duct systems and electrical equipment such as meters, switches/electrical	<u>Advantages</u> Avoids or delays the need to remove or relocate at-risk assets. Cost-effective at reducing risk.	<u>Wainui Beach Specific Notes</u> It is recognised that many of the existing structures along Wainui Beach are significantly deteriorated and need to be maintained with modern engineering standards. However, they should not be engineered to a greater level of (service) protection than the initial structure was designed for. Further, many of the upper/back dune areas are in poor condition and restoration of native species in these areas should provide increased hazard resilience.
	<u>Disadvantages</u> May have adverse effects on appearance or impact the visual amenity. Requires regular maintenance and may require clean up after events. If event exceeds design parameters, they may not be effective. Minor alterations that accommodate inundation do not address potential loss of access to property during event.	

fittings and outlets), and raising doorway seals (coatings, sealants, and waterproof veneer). Alterations to reduce erosion can include but not be limited to removing the risk of erosion driven by stormwater runoff (e.g. outlets directly flowing onto beach/dune), relocatable infrastructure/dwellings that can be moved further back from the hazard zone as the hazard is realised, implementation of dune nourishment and sand push ups.	There is still potential risk to properties from defence failure or design exceedance. This can contribute to community complacency behind the structures.	
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CONTINUE TO INCREASE COMMUNITY EDUCATION AND RISK AWARENESS

 <u>Definition</u> Education and awareness to help people make informed decisions and play a role in both climate change mitigation and adaptation, and to learn about coastal hazards.	<u>Advantages</u> Improves community awareness and understanding of hazards. Increases community resilience. Easily implemented.	<u>Wainui Beach Specific Notes</u> It is recognised that a significant number of retirees and children reside within Wainui Beach Suburb and these groups tend to be more susceptible to impacts of natural hazards. In particular children will be unaware of the hazards that exist along the beach after an erosion event & elderly residents and children may not be able to evacuate from dwellings in time during an inundation event. These more vulnerable people need to be educated about the risks with the need to deliver / develop specific emergency plans.
	<u>Disadvantages</u> Does not reduce the risk directly.	

EMERGENCY MANAGEMENT

	<u>Advantages</u> Improves community awareness and understanding of hazards. Increases community resilience.	<u>Wainui Beach Specific Notes</u> Improve emergency management response to natural hazards. As described under 2.1 'Emergency Response' more focus needs to be put into a
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 <u>Definition</u> Covers responsive measures, that include temporary works such as demountable flood barriers that stop water entering an area, emergency sand bagging or protection and temporary sand push ups or stream realignment to manage erosion hazards.	Easily implemented.	prioritised response system that distinguishes which risks should be addressed first.
	<u>Disadvantages</u> Does not reduce the risk directly beyond the immediate event. Efficacy is limited to the design level of the protection.	

INCREASE ENVIRONMENTAL MONITORING AND INVESTIGATIONS

 <u>Definition</u> This involves increasing any monitoring undertaken to include systematic observations and measurements. This could be done by increasing routine monitoring or introducing new techniques and will help in understanding how the coastline is changing. This may include topographic and bathymetric surveys, shoreline mapping, ecological surveys, structural assessments, and morphological change assessments.	<u>Advantages</u> Helps understand past and current conditions and how the environments are changing to help us plan for future climate change. Easily implemented.	<u>Wainui Beach Specific Notes</u> Currently beach monitoring is limited to approximately 14 profile locations along the beach with some areas with better coverage than others. By integrating new monitoring techniques like drone surveys can give better coverage & are quicker to use. This will allow for an improved data set from which to aid understanding of hazards along Wainui and inform management response.
	<u>Disadvantages</u> Does not reduce the risk directly.	

2.4 PROTECT

The Protect approach aims to interrupt and keep the coastal hazard away from the site. Coastal hazards can be interrupted by using soft engineering approaches, hard engineering approaches, or a combination of the two where appropriate for the protection of the site.

FOREDUNE RECONSTRUCTION AND REGENERATION

 <u>Definition</u> Foredune reconstruction and regeneration can take many forms including building fences on the seaward side of an existing dune to trap sand and promote dune growth, and vegetation planting to stabilise dunes. Foredunes provide a dynamic store of sediment landward of the high tide line that changes in response to wind, waves or sea level. This store of sediment acts as both a barrier to water and it is able to supply sediment to the beach during times of erosion and store it again after.	<u>Advantages</u> - Provide resilience during storm conditions. - Restore natural character to an area. - Provide habitats for animals and plants. - Cost-effective relative to traditional engineering protection. <u>Disadvantages</u> - Can act as a barrier to beach access. - Large footprint and requires a large amount of land. - Require frequent monitoring and maintenance. - There is still potential risk to properties from defence failure or design exceedance. This can contribute to community complacency behind the protective dunes.	<u>Wainui Beach Specific Notes</u> Due to the perched nature of the dune system at Wainui Beach there is limited opportunity for these measures to be successful long term.
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ARMOURING

	<u>Advantages</u> - Height of structures may be increased overtime to respond to SLR. <u>Disadvantages</u> - Expensive to design, construct and maintain. - Overtopping when water exceeds height of	<u>Wainui Beach Specific Notes</u> Due to the narrow high tide beach margin along Wainui Beach, the effects of structure encroachment are likely to be more pronounced. This will be compounded in time with predicted SLR where a dry high tide beach margin may only be present intermittently.
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<u>Definition</u> These structures prevent erosion by protecting the land from light to heavy wave action. Built parallel to the shoreline and can take many forms, such as rock revetments, concrete walls, sand-filled geotextile tubes that can be on the shoreline or set-back, vertical or sloped and exposed or buried. These structures deflect oncoming waves. Height of structures can be increased to respond to SLR. Vertical seawalls deflect wave energy away from the coast and are the most easily designed and constructed type of sea wall. Rock revetments are sloping structures and are very often constructed as permeable structures using rocks or concrete blocks to enhance wave energy absorption and dissipation. Complex structures can incorporate the advantages of a curved rear wave wall and steep concrete or rock revetment.	structure which can weaken and remove sediment behind structure and lead to an increase in pressure and collapse of the structure. Interrupt natural processes and result in coastal 'squeeze' where the beach in front of the structure is lost. Wave reflection from armouring structures can have negative effects on surf break quality. Sediment availability along coastline can be impacted as they interfere with natural erosion processes that would normally supply sediment to the beach. Recognised impact on adjacent land, known as the end effects of structures. Hinders access to beach. There is still potential risk to properties from defence failure or design exceedance. This can contribute to community complacency behind the structures.	Wainui beach is a well know & quality surf break that is recognised as a 'Surf Break of National Significance' under the New Zealand Coastal Policy Statement 2010 (NZCPS). Wave reflection from structures on beaches is known to have a detrimental effect to surf break quality under certain conditions. Any new armouring infrastructure will have to undergo detailed costal processes assessment and may face strong opposition from community groups.
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FLOOD EXCLUSION DEFENCES (TEMPORARY OR PERMANENT)

	<u>Advantages</u> Reduces flood risk. Reduced wave loadings and toe scour due to angle of slope when compared to vertical structures.	<u>Wainui Beach Specific Notes</u> Flood risk at Wainui Beach is a secondary consideration to the potential erosion risk.
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<u>Definition</u> Continuous elongated structure parallel to the coast designed to protect low-lying areas from inundation, designed to sufficiently prevent or minimise overtopping in a specific flood event. A gentle seaside slope reduces wave loadings and scour, while on the landward side they have steeper slopes to minimise space requirements. Flood exclusion defences are similar physical structures to stop banks and serve similar purposes but are less engineered than a stopbank and use local materials with minor foundation preparations. Flood exclusion defences can also be around land parcels to protect from inundation.	<u>Disadvantages</u> Barrier to inland habitat migration. Hinders access to coast. Potential for water to seep through and groundwater or runoff to collect behind structure. There is still potential risk to properties from defence failure or design exceedance. This can contribute to community complacency behind the structures.	
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2.5 RETREAT

The Retreat approach aims to reduce or eliminate the exposure to coastal hazards by retreating or relocating existing and planned development away from the coastal hazard. The risk to assets is reduced or removed entirely, leaving the coast to respond to natural processes.

MOVE BUILDINGS ON LAND PARCEL

 <u>Definition</u> Used to manage coastal hazards by relocating buildings to be further from the coast. This can be through	<u>Advantages</u> Hazard risk to assets and infrastructure is reduced or removed entirely. Prevents the need for hard protection structures and provides enough space to establish or enhance natural protection options. Maintains natural aesthetic, function and processes.	<u>Wainui Beach Specific Notes</u> Due to some of the house/parcel size ratios the ability to retreat is somewhat restricted. Further, it may only be buying a limited amount of time on the most seaward properties.
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constructing new buildings further from the inundation extent to building new relocatable buildings on site for future relocation.	<u>Disadvantages</u> Availability of land to move to. Cost of relocation or reconstruction.	
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MOVE LOCATION / MANAGED RETREAT

 <u>Definition</u> Move entire property/buildings to a new land parcel situated further from the coast to reduce exposure from coastal hazards. Applicable to locations where neither structural protection or soft engineering solutions are feasible, retreat and relocation may be the only practical alternative.	<u>Advantages</u> Hazard risk to assets and infrastructure is reduced or removed entirely. Prevents the need for hard protection structures and provides enough space to establish or enhance natural protection options.	<u>Wainui Beach Specific Notes</u> Limited areas for relocation within the Wainui Catchment due to the presence of other hazards (e.g. Geotechnical constraints and flooding).
	<u>Disadvantages</u> Requires landowners to surrender coastal land that might be of importance to them. Availability of land to move to. Cost of relocation or reconstruction.	

3 COASTAL HAZARD ADAPTATIVE PATHWAY PLANNING

Coastal hazard adaptative pathway planning will allow GDC and the Wainui community to prepare now for the future uncertainties associated with SLR and coastal hazards. The adaptation planning for each of the coastal sections along Wainui Beach might change at any time to account for new information, new processes, and changes in priority by GDC and the community.

To ensure that the proposed adaptation pathway plans are supported and accepted by the community and GDC, it is proposed that the pathways will undergo community engagement with the Wainui Beach community and mana whenua.

The engagement aims to:

- Develop a shared understanding of coastal hazards and risk, and local knowledge and issues.
- Build an understanding of the roles and responsibilities.
- Seek community input to the adaptation pathways proposed for each coastal section.

3.1 HOW WE APPLIED AN ADAPTIVE PLANNING APPROACH

Using the range of approaches and management options outlined in Section 2, a list of pathway options considered for each coastal section in the short-term (5 to 20 years), medium-term (20 to 50 years) and long-term (more than 50 years) was identified (Section 4 to Section 7). Using the list of considered options a 'preferred pathway' was identified for each coastal section. All options considered are included, however the 'preferred pathway' was identified to help guide community consultation and the other considered options were still left on the table for the consultation.

Adaptation pathways are developed with a consideration of their effectiveness (will the option effectively address hazard/risks), environmental impact (are the environmental impacts acceptable), and feasibility (implementation barriers).

An essential element of any adaptive planning is the monitoring of relevant indicators with implementation of the plan to track changes relative to an option's continued functionality or threshold. To do this the adaptive pathways are trigger-based to ensure that GDC and the community implement changes when required. A trigger-based approach is important with the increasing future uncertainty of coastal hazards and SLR with time.

It is intended that triggers would allow any change that occurs to be monitored and to have an agreed trigger point on which to adapt. Once a trigger has been met, further investigations are undertaken to understand the impending risk and hazard to help guide the decision to implement the next suggested adaptation option.

Triggers highlight impending changes in coastal hazard risk and can come in a range of indicators such as, physical (e.g. coastal erosion), cultural (e.g. loss of taonga), social (e.g. public access), environmental (e.g. loss of amenity), or economic (e.g. high protection/maintenance costs). A trigger-based adaptation plan ensures that investment or implementation of a new adaptation option is based on observations of coastal change.

3.1.1 *LIMITATIONS OF APPROACH*

There are several limitations and assumptions inherent in the methodology used to identify adaptation pathways for each section of Wainui Beach. These limitations include:

- Adaptation options have been developed based on current understanding of coastal hazards Report (WSP, 2023) and risks identified within the coastal risk (WSP, 2024) and the associated limitations outlined within each report. Beach behaviour and response may change in response to increased rate of SLR, presenting a degree of uncertainty. Suggested triggers for future action have tried to allow for this.
- The adaptation options considered for each coastal section along Wainui Beach are preliminary and will go through an engagement period with the community and GDC where they may be further refined, removed from the pathway or changed to accommodate alignment with community objectives.

4 NORTHERN BEACH SECTION

This adaptive pathway has been prepared for GDC and the Wainui community and is intended to advise possible adaptation pathways and give an indicative timeframe of these pathways in current and future climates for the Northern Section of Wainui Beach (Figure 4-1).



Figure 4-1 Map showing key assets at risk to coastal hazards in the Northern Section of Wainui Beach

COASTAL SETTING

The northern section of the beach is characterised by a perched dune system. This is most evident during periods of low sand levels when significant exposures of bedrock material are evident along the beach. There are currently no coastal protection structures in place. The most significant erosion issue is situated at Pines Carpark which is associated with stormwater run-off from the paved carpark.

RISK OF COASTAL HAZARDS

The most significant hazard risk for the Northern Section of the beach are the risks associated with coastal erosion hazards. The assets most at risk to coastal hazards along this section are carparks, public stairs, the Surf Lifesaving Club and recreation reserves. A summary of the risks along the Northern Section in the short-term, medium-term and long-term are summarised in Table 4-1 below.

Table 4-1 Summary of risks associated with coastal hazards in the short-term, medium-term and long-term along the Northern Section of Wainui Beach

SHORT-TERM (5 TO 20 YEARS) VULNERABILITY TO COASTAL HAZARDS	In the short-term (5 to 20 years), the Surf Lifesaving Club, all public stairs and three carparks in the Northern Section of the beach are at risk of the coastal hazards associated with erosion. Five public stairs are also at risk of coastal inundation and storm impacts. In the short-term there are no risks associated with fluvial flooding and cliff instability.
MEDIUM-TERM VULNERABILITY TO COASTAL HAZARDS	In the medium-term (20-50 years), the Surf Lifesaving Club, all public stairs and four carparks in the Northern Section of the beach are at risk of the coastal hazards associated with erosion. Five public stairs are also at risk of coastal inundation. In the medium-term there are no risks associated with fluvial flooding and cliff instability.
LONG-TERM VULNERABILITY TO COASTAL HAZARDS	In the long-term (50+ years), the Surf Lifesaving Club, all public stairs and four carparks in the Northern Section of the beach are at risk of the coastal hazards associated with erosion. Seven public stairs are also at risk of coastal inundation. In the long-term there are no risks associated with fluvial flooding and cliff instability in the northern section of the beach.

ADAPTIVE PATHWAYS

The adaptive pathways for the Northern Section of Wainui Beach have been suggested due to their practicality, taking the beach sections current vulnerability to coastal hazards into consideration, as well as any future increases in vulnerability due to SLR and climate change. The pathway anticipates future community-level engagement and activities that GDC and the community should be aware of and consider contributing to as well.

SHORT-TERM PATHWAY

A Do Nothing/Business as Usual approach with small elements of Protect & Accommodate included is recommended as the short-term pathway for the Northern Section of Wainui Beach. This pathway should be considered as there are no imminent coastal hazard risks along most of this section of the beach as the coastal erosion risks at the Surf Lifesaving Club and carparks are of a progressive and temporal nature and can be monitored before there is immediate risk to life or assets.

The coastal inundation and erosion risks on the public stairs are an accepted risk in the short-term simply because of the nature of their purpose and location (adjacent to the sea) and BAU maintenance and monitoring of these should continue. It is recommended that any maintenance work undertaken on the public stairs takes into account requirements under the Building Act 2004 and recommendations under the Building Code. Any work undertaken on these structures is required to be compliant with these provisions, regardless of if a Building Consent is required or not.

Reconfiguration of Pines Carpark is also suggested in the short-term to allow for more effective discharge of stormwater. This is recommended to remove the current issue with stormwater discharging down through Pines Carpark and onto dune which has resulted in erosion of the dune where the stormwater discharges. This option has already been triggered as there are current erosion problems due to the ineffective discharge of stormwater from the Pines Carpark down the dune. Opportunity to retreat the infrastructure should be taken whilst work is being planned.

A more structured & larger dune restoration could be implemented in this pathway time frame as well. It is noted that dune restoration along Northern Wainui should focus back dune and dune face stabilisation. Due to the nature of the uplifted dune system, there is no available space for a foredune to establish. Stabilisation of the dune face will provide some level of resilience against erosion hazards in the short term.

A NZTA culvert is noted at the very northern end of the beach, which drains the small stream that runs through Okitu Scenic Reserve. The structure appears to be performing adequately with only minor evidence of scour at the base and deterioration of the structure. It is suggested that performance of the structure and potential impacts on beach scour/erosion is observed and monitored under high flow conditions.

MEDIUM-TERM AND LONG-TERM PATHWAYS

A Do Nothing/Business as Usual approach is recommended as the medium-term pathway for the northern part of the Northern Section of Wainui Beach where no high-risk assets (such as buildings, roads etc.) are located within future coastal hazard zones.

A managed retreat approach is suggested for other carparks and the Surf Lifesaving Club in the medium and long-term and should be tied in when erosion is within 5m of key assets and/or asset management provisions or building end of life plans.

As noted above, due to the nature of the perched and over-steep dune system and no accommodation space available to hold foredunes along the Northern Section of Wainui Beach, soft engineering options that involve planting and foredune regeneration under the Protect approach are not applicable to this section and therefore have not been suggested. There are opportunities to undertake back dune regeneration to provide ecological and landscape benefits. However, this will provide limited hazard resilience opportunities in the medium to long term as the frequency of toe instability increases.

The short-listed adaptation options considered along the Northern Section of the Wainui Beach coastline are displayed below in Table 4-2.

Table 4-2: Short-listed adaptation options considered. Note: Refer to Section 2 for more detail on each option

		Options considered
Short-term	Do Nothing/Business as Usual	All current coastal hazard management activities continue. Continue business as usual maintenance

		on assets and continue current emergency management and environmental monitoring activities to existing level of service.
	Accommodate 	Reconfiguration of Pines Carpark to allow for more effective discharge of stormwater. This is recommended to remove the current issue with stormwater discharging down through Pines Carpark and onto dune which has resulted in erosion of the dune where the stormwater discharges.
Medium-term	Do Nothing/Business as Usual 	All current coastal hazard management activities continue. Continue business as usual maintenance on assets and continue current emergency management and environmental monitoring activities to existing level of service.
	Retreat 	Relocate the Surf Lifesaving Club and the Pines Carpark further back within the existing land parcel away from coastal hazards. The retreat of carparks is recommended to be tied in with asset management provisions or specific erosion triggers. The retreat of the Surf Lifesaving Club is recommended to be based on erosion triggers.
Long-term	Retreat 	Relocate the Surf Lifesaving Club and the Pines Carpark further back within the existing land parcel away from coastal hazards. The retreat of carparks is recommended to be tied in with assessment management provisions or specific erosion triggers. The retreat of the Surf Lifesaving Club is recommended to be based on erosion triggers. Stairs need to be built at a minimum to modern engineering and accessibility standards with additional modifications made for high energy wave attacks.

5 CENTRAL BEACH SECTION

This adaptive pathway has been prepared for GDC and the Wainui community and is intended to advise possible adaptation pathways and give an indicative timeframe of these pathways in current and future climates for the Central Section of Wainui Beach (Figure 5-1).

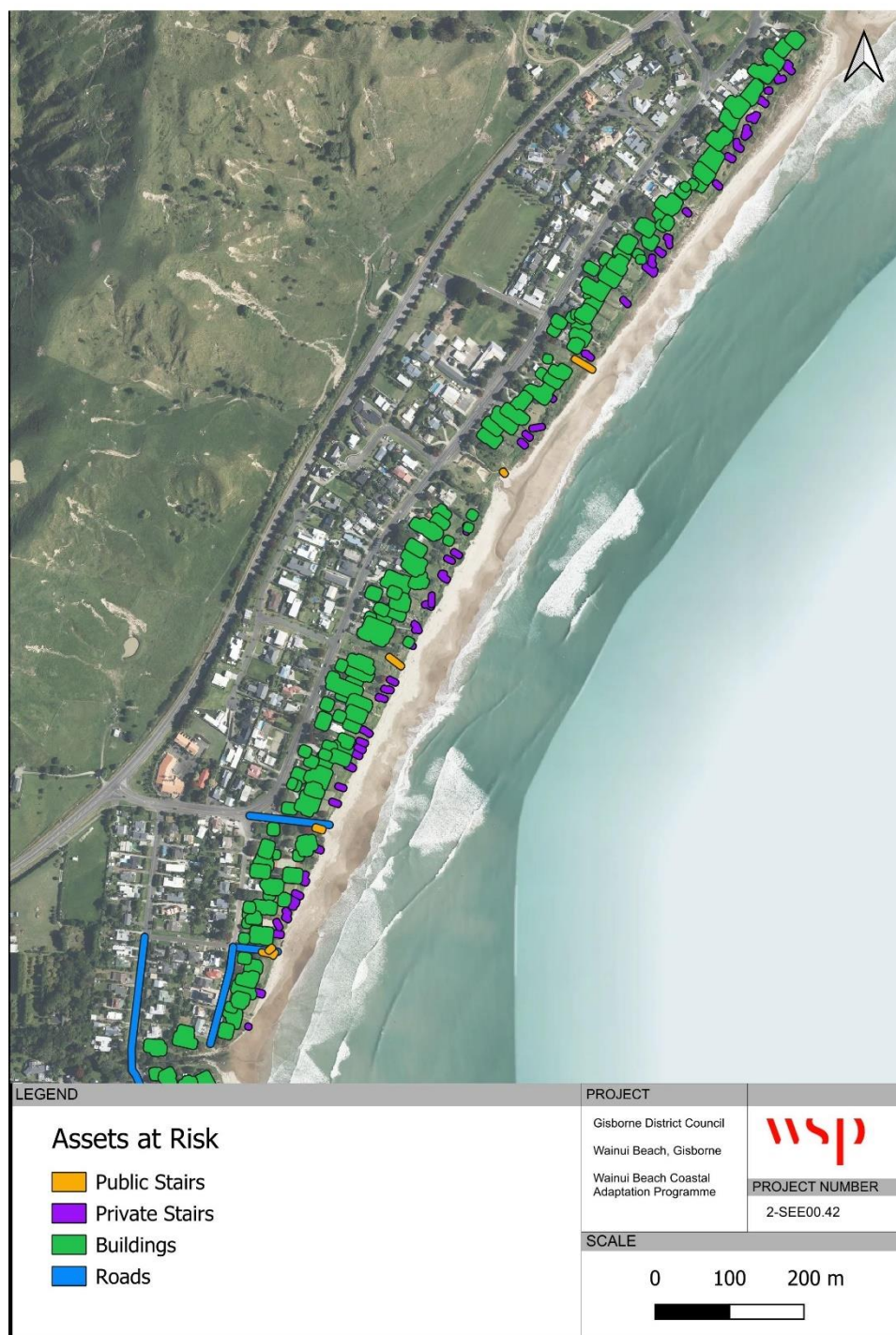


Figure 5-1 Map showing key assets at risk to coastal hazards in the Central Section of Wainui Beach

COASTAL SETTING

The beach along the central section is characterised by a raised dune system and increased beach widths. There is a small foredune system situated in the northern portion of the section. This has resulted in part from the small stream training groyne on the true right bank of the Hamanatua Stream mouth. It is also noted that the accommodation space for foredune development is increased as the raised dune crest is set more landward.

There are various low coastal protection structures along the length of the section which are predominantly comprised of gabion baskets. These are mostly contiguous in nature and installed by GDC in the past. The structures become exposed during periods of low sand levels with the frequency of exposure increasing in the southern portion of the section.

RISK OF COASTAL HAZARDS

The most significant hazard risk for the Central Section of Wainui Beach are the risks associated with coastal erosion hazards. The assets most at risk to coastal hazards along this section are buildings, roads, private and public stairs and recreation reserves. A summary of the risks along the Central Section in the short-term, medium-term and long-term are summarised in Table 5-1 Table 4-1 below.

Table 5-1 Summary of risks associated with coastal hazards in the short-term, medium-term and long-term along the Central Section of Wainui Beach

SHORT-TERM (5 TO 20 YEARS) VULNERABILITY TO COASTAL HAZARDS	In the short-term (5 to 20 years), 41 buildings, Oneroa Road, Cooper Street and Pare Street, 39 private and all public stairs in the Central Section of the beach are at risk of the coastal hazards associated with erosion. One building, Oneroa Road and Cooper Street, and 10 private stairs are also at risk to coastal inundation. In the short-term there are four buildings at risk of fluvial flooding and there are no risks associate with cliff instability hazards.
MEDIUM-TERM VULNERABILITY TO COASTAL HAZARDS	In the medium-term (20-50 years), over 50 buildings, Oneroa Road, Cooper Street and Pare Street, all private stairs, and all public stairs in the Central Section of the beach are at risk of the coastal hazards associated with erosion. One building, Oneroa Road and Cooper Street, 13 private stairs are also at risk to coastal inundation. In the medium-term there are four buildings at risk of fluvial flooding and there are no risks associate with cliff instability hazards.
LONG-TERM VULNERABILITY TO COASTAL HAZARDS	In the long-term (50+ years), over 100 buildings, Oneroa Road, Cooper Street and Pare Street, all private stairs and all public stairs in the Central Section of the beach are at risk of the coastal hazards associated with erosion. Two buildings, Oneroa Road, Cooper Street and Pare Street, 20 private stairs and all public stairs are also at risk to coastal inundation. In the long-term there are four buildings at risk of fluvial flooding and there are no risks associate with cliff instability hazards.

ADAPTIVE PATHWAYS

The adaptive pathways for the Central Section of Wainui Beach have been suggested due to their practicality, taking the beach section's current vulnerability to coastal hazards into consideration as

well as any future increases in vulnerability due to SLR and climate change. The pathway anticipates future community-level engagement and activities that GDC and the community should be aware of and consider contributing to as well.

SHORT-TERM PATHWAY AND MEDIUM-TERM PATHWAY

An Accommodate approach is recommended as the short-term and medium-term pathway for the Central Section of Wainui Beach for the protection structures by maintaining to the existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues associated with the existing protection structures.

Alongside this approach dune restoration/regeneration under the Protect approach is also recommended to help restore the existing dune (back) systems along this section and provide an increased level of resilience against coastal erosion. It is noted for this section there is limited space for a foredune to establish, with the most substantive area situated from the wooden groyne at the Hamanatua Stream south. Therefore, the most significant benefit of back dune restoration along the Central Section is in providing increased slope stability, as well as increased ecological and amenity benefits.

LONG-TERM PATHWAY

A Protect and Managed Retreat approach is suggested as the long-term pathway of the Central section of the beach due to the indicative future coastal hazards that this section of the coastline may experience. These approaches are trigger-based and should begin to be considered when the mean high-water neap² position has been recorded at the toe of the dune escarpment for a period exceeding one year. The short-listed adaptation options considered along the Central Section of the Wainui Beach coastline are displayed below in Table 5-2.

It is important to note that a mix of retreat and protect approaches along the beach is unlikely to be successful and a singular approach preferred.

Table 5-2: Short-listed adaptation options considered. Note: Refer to Section 2 for more detail on each option

		Options considered
Short-term	Do Nothing/ Business as Usual	All current coastal hazard management activities continue. Continue business as usual maintenance

² The mean high water neap is the average levels of each pair of successive high waters, during a period of about 24 hours approximately every 14 days, when the range of the tide is least (neap range)

		on assets and continue current emergency management and environmental monitoring activities to the existing level of service.
	Accommodate 	Accommodate existing protecting structures by maintaining to the existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues with the existing protection structures. As best as practicable a uniform design shall be applied across all sites to ensure equitable performance and environmental outcomes/controls.
	Protect 	Implement dune restoration and regeneration activities for the dune system along the Southern Section. It is recommended to use dune building species around the stream mouths and employ native planting strategies in the upper dunes to promote slope stability.
Medium-term	Accommodate 	Accommodate existing protecting structures by maintaining to the existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues with the existing protection structures. As best as practicable a uniform design shall be applied across all sites to ensure equitable performance and environmental outcomes/controls.
	Protect 	Implement dune restoration and regeneration activities for the dune system south of the Hamanatua Stream Groyne. It is recommended to use dune building species around the stream mouths and employ native planting strategies in the upper dunes to promote slope stability.
Long-term	Protect 	Implementation of hard engineering options to prevent erosion and inundation of assets located directly adjacent to the coast in the Central Section.
	Retreat	



Managed retreat of the buildings at risk to coastal hazards along the Central Section to new land parcel as there is no available land on the existing land parcels for properties to be relocated too.

6 WAINUI STREAM AND HAMANATUA STREAM SECTIONS

This adaptive pathway has been prepared for GDC and the Wainui community and is intended to advise possible adaptation pathways and give an indicative timeframe of these pathways in current and future climates for the Wainui Stream and Hamanatua Stream Sections of Wainui Beach.

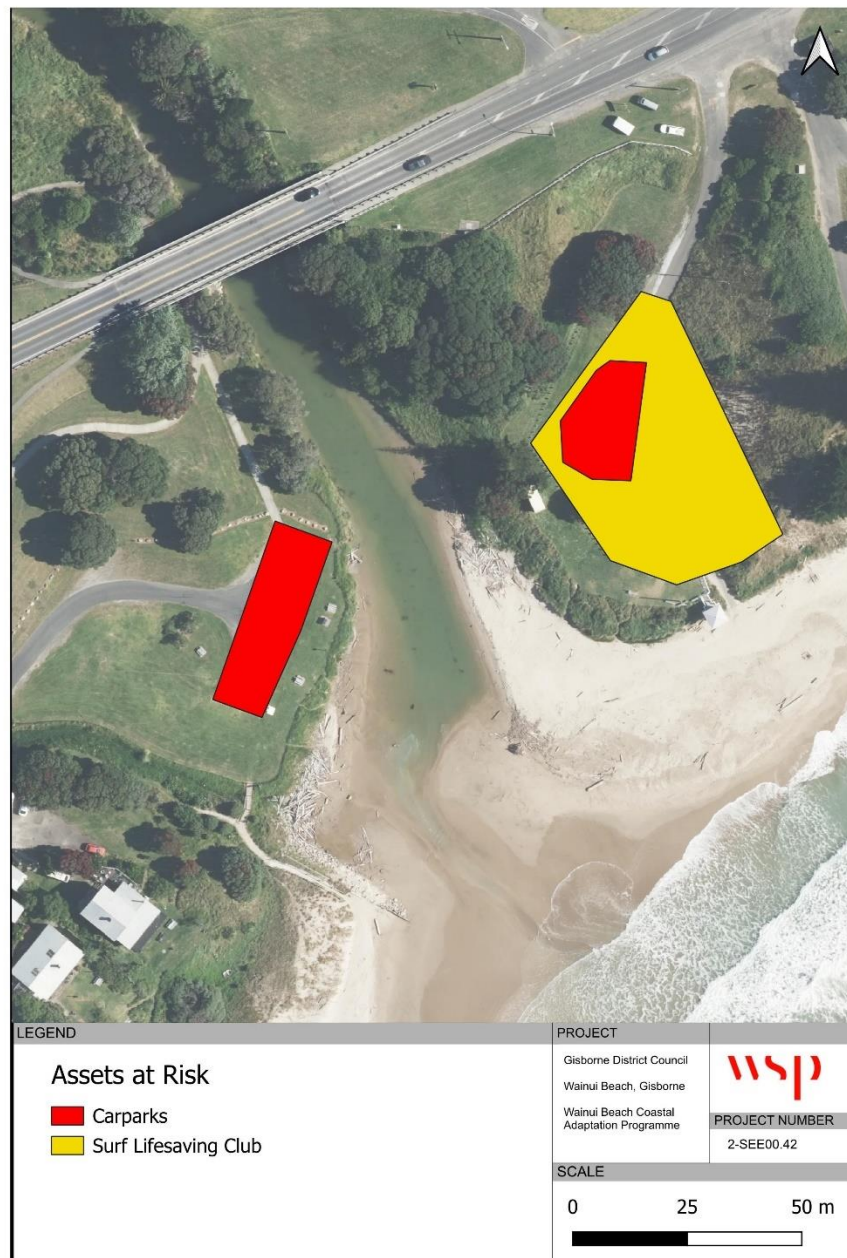


Figure 6-1 Map showing key assets at risk to coastal hazards in the Hamanatua Stream Section of Wainui Beach

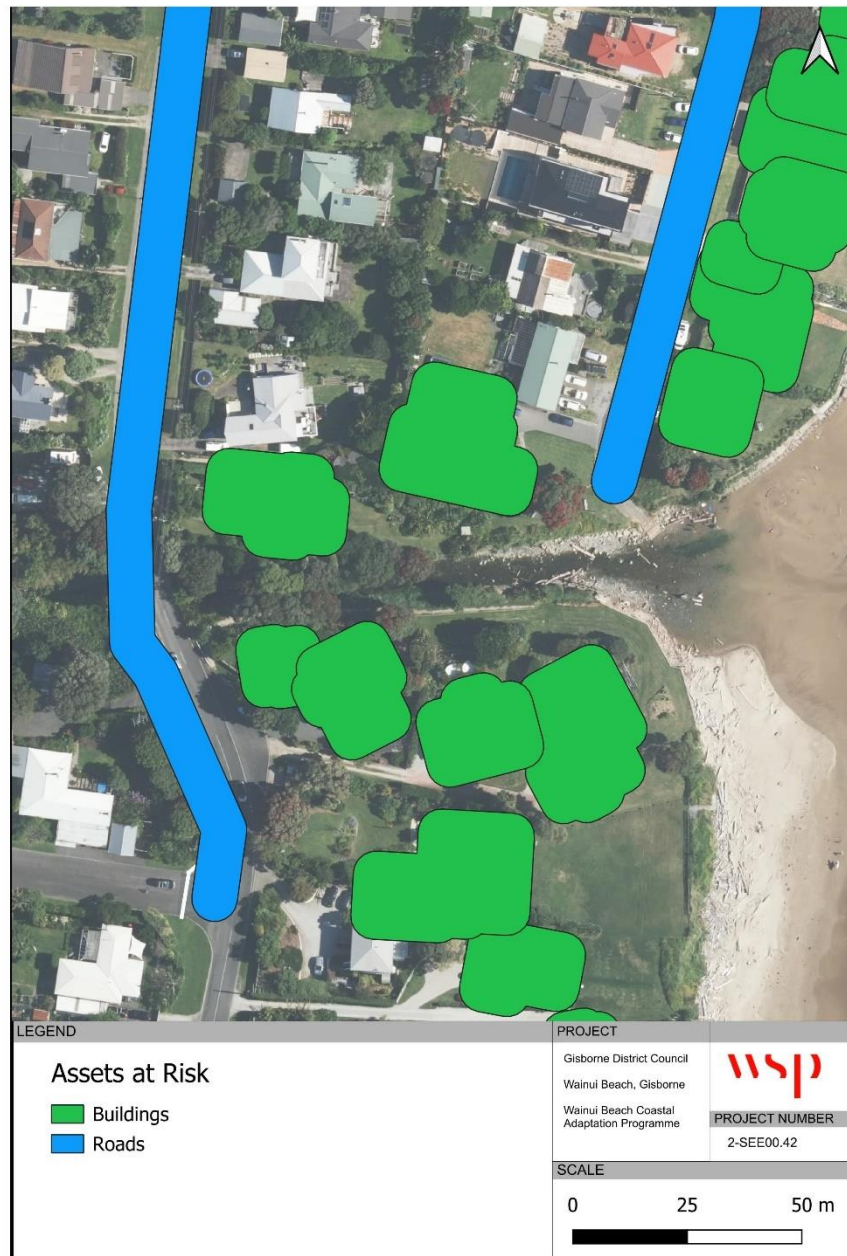


Figure 6-2 Map showing approximate key assets locations at risk to coastal hazards in the Wainui Stream Section of Wainui Beach

COASTAL SETTING

Neither the Wainui and Hamanatua Streams are substantial enough to have a consistent breach point across the dry high tide beach area. Analysis of stream mouth positions does not indicate any clear preference in breach direction, but the location of the groyne at Hamanatua Stream mouth does indicate a historical southern migration. The embankments of the Wainui Stream mouth are armed with timber retaining walls of varying states of repair.

The toe of these structures is protected by gabion baskets which are considered to be in poor condition with maintenance work regularly being undertaken on them. Landward of the structure on the true right bank is subject to erosion under flood and storm conditions. This led to a set of public access stairs being compromised in recent years. Similarly, the end of the access boardwalk

on the true right bank of the Hamanatua was compromised in storm activity at the end of June 2024.

RISK OF COASTAL HAZARDS

The most significant hazard risk for the Wainui Stream and Hamanatua Stream Sections of Wainui Beach are the risks associated with coastal erosion and inundation. The assets most at risk along the Wainui Stream mouth are buildings and roads. The assets most at risk along the Hamanatua Stream mouth are the Surf Lifesaving Club and public carparks. A summary of the risks along the Wainui and Hamanatua Stream Sections of Wainui Beach in the short-term, medium-term, and long-term are summarised in Table 6-1 below.

Table 6-1 Summary of risks associated with coastal hazards in the short-term, medium-term and long-term along the Wainui and Hamanatua Stream Sections of Wainui Beach

SHORT-TERM (5 TO 20 YEARS) VULNERABILITY TO COASTAL HAZARDS	In the short-term (5 to 20 years), the Surf Lifesaving Club, one carpark, Pare Street and five buildings in the Stream Sections of the beach are at risk of the coastal hazards associated with erosion. One building is also at risk to coastal inundation. In the short-term, Murphy Road and three buildings are at risk of fluvial flooding and there are no risks associated with cliff instability hazards.
MEDIUM-TERM VULNERABILITY TO COASTAL HAZARDS	In the medium-term (20-50 years), the Surf Lifesaving Club, one carpark, Pare Street and Murphy Road, and five buildings in the Stream Sections of the beach are at risk of the coastal hazards associated with erosion. Two buildings are also at risk to coastal inundation. In the medium-term, Murphy Road and three buildings are at risk of fluvial flooding and there are no risks associate with cliff instability hazards.
LONG-TERM VULNERABILITY TO COASTAL HAZARDS	In the long-term (50+ years), the Surf Lifesaving Club, Pare Street and Murphy Road, two carparks and seven buildings in the Streams Section of the beach are at risk of the coastal hazards associated with erosion. Pare Street and four buildings are also at risk to coastal inundation. In the long-term, Murphy Road and three buildings are at risk of fluvial flooding and there are no risks associate with cliff instability hazards.

ADAPTIVE PATHWAYS

The adaptive pathways for the stream sections of Wainui Beach have been suggested due to their practicality, taking the beach sections current vulnerability to coastal hazards into consideration, as well as any future increases in vulnerability due to SLR and climate change. The pathway anticipates future community-level engagement and activities that GDC and the community should be aware of and consider contributing to as well.

SHORT-TERM PATHWAY

A Do Nothing/Business as Usual approach is suggested as the short-term pathway for the stream sections of Wainui Beach. The level of risk to coastal hazards is relatively low in the short-term.

An Accommodate approach is suggested in the short-term where the Council should begin the management and monitoring of the stream mouth position to reduce the pressures on adjoining structures and potentially assist with water quality issues. Under the Accommodate approach is it

also suggested that existing protection structures should be maintained to existing levels of service using modern engineering practices where they have not been already.

This will aid in mitigating any existing health and safety issues associated with the existing protection structures. It is recommended to specifically maintain the existing groyne located along the mouth of the Hamanatua Stream to also enable further establishment of the dune system south of the groyne.

MEDIUM-TERM PATHWAY

An Accommodate approach is suggested as the medium-term pathway for the stream sections of Wainui Beach. Under this approach, existing protection structures should be maintained to existing levels of service using modern engineering practices. This will aid in mitigating any existing health and safety issues associated with the existing protection structures.

It is recommended to specifically maintain the existing groyne located along the mouth of the Hamanatua Stream to also enable further establishment of the dune system south of the groyne. Under this approach flood proofing of buildings around the Wainui Stream that are at risk to coastal inundation is also recommended.

LONG-TERM PATHWAY

A Protect and Managed Retreat pathway is suggested for the long-term pathway of the stream sections of Wainui Beach. Under a Protect approach flood exclusion defences are suggested to reduce the risk of coastal inundation to the buildings located along Wainui Stream. Under a Managed Retreat approach, it is recommended to retreat buildings at risk along the streams to new land parcel as there is no available land on the existing land parcels for properties to be relocated too.

Relocate the Surf Lifesaving Club and the Pines Carpark further back within the existing land parcel away from coastal hazards. These approaches are trigger based and should begin to be considered when properties around Wainui Stream are inundated more than three times in a 5-year period.

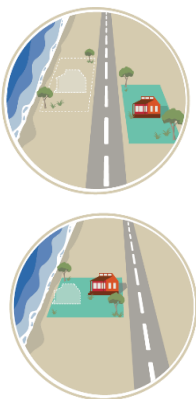
This trigger should be refined by site specific investigations to establish the flood resilience of the properties following an event should the properties be inundated. An erosion-based trigger for both streams is when the toe of the erosion protection structures (such as the lower gabion baskets) along the streambanks are exposed for a period exceeding a year.

The short-listed adaptation options considered along the Stream Sections of the Wainui Beach coastline are displayed below in Table 6-2.

Table 6-2: Short-listed adaptation options considered. Note: Refer to Section 2 for more detail on each option

		Options considered
Short-term	Do Nothing/Business as Usual	All current coastal hazard management activities continue. Continue business as usual maintenance

		on assets and continue current emergency management and environmental monitoring activities to existing level of service.
	Accommodate 	Accommodate existing protecting structures by maintaining to existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues with the existing protection structures. As best as practicable a uniform design shall be applied across all sites to ensure equitable performance and environmental outcomes/controls. Specifically maintain the existing groyne located along the mouth of the Hamanatua Stream to also enable further establishment of the dune system south of the groyne It is recommended to begin management and monitoring of the stream mouths to reduce the pressures on adjoining structures and potentially assist with water quality issues.
Medium-term	Accommodate 	Accommodate existing protecting structures by maintaining to existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues with the existing protection structures. As best as practicable a uniform design shall be applied across all sites to ensure equitable performance and environmental outcomes/controls. Specifically maintain the existing groyne located along the mouth of the Hamanatua Stream to also enable further establishment of the dune system south of the groyne. Incorporate flood proofing into buildings at risk to inundation around Wainui Stream.
Long-term	Protect 	Implement temporary or permanent flood exclusion defences where there is risk of coastal inundation to buildings around the Wainui Stream.
	Retreat	

		Managed retreat of the buildings at risk along the streams to new land parcel as there is no available land on the existing land parcels for properties to be relocated too. Retreat buildings at risk to coastal inundation around Wainui. Relocate the Surf Lifesaving Club and the Pines Carpark further back within the existing land parcel away from coastal hazards. The retreat of the Surf Lifesaving Club is recommended to be based on erosion triggers.
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7 SOUTHERN BEACH SECTION

This adaptive pathway has been prepared for GDC and the Wainui community and is intended to advise possible adaptation pathways and give an indicative timeframe of these pathways in current and future climates for the Southern Section of Wainui Beach (Figure 7-1).

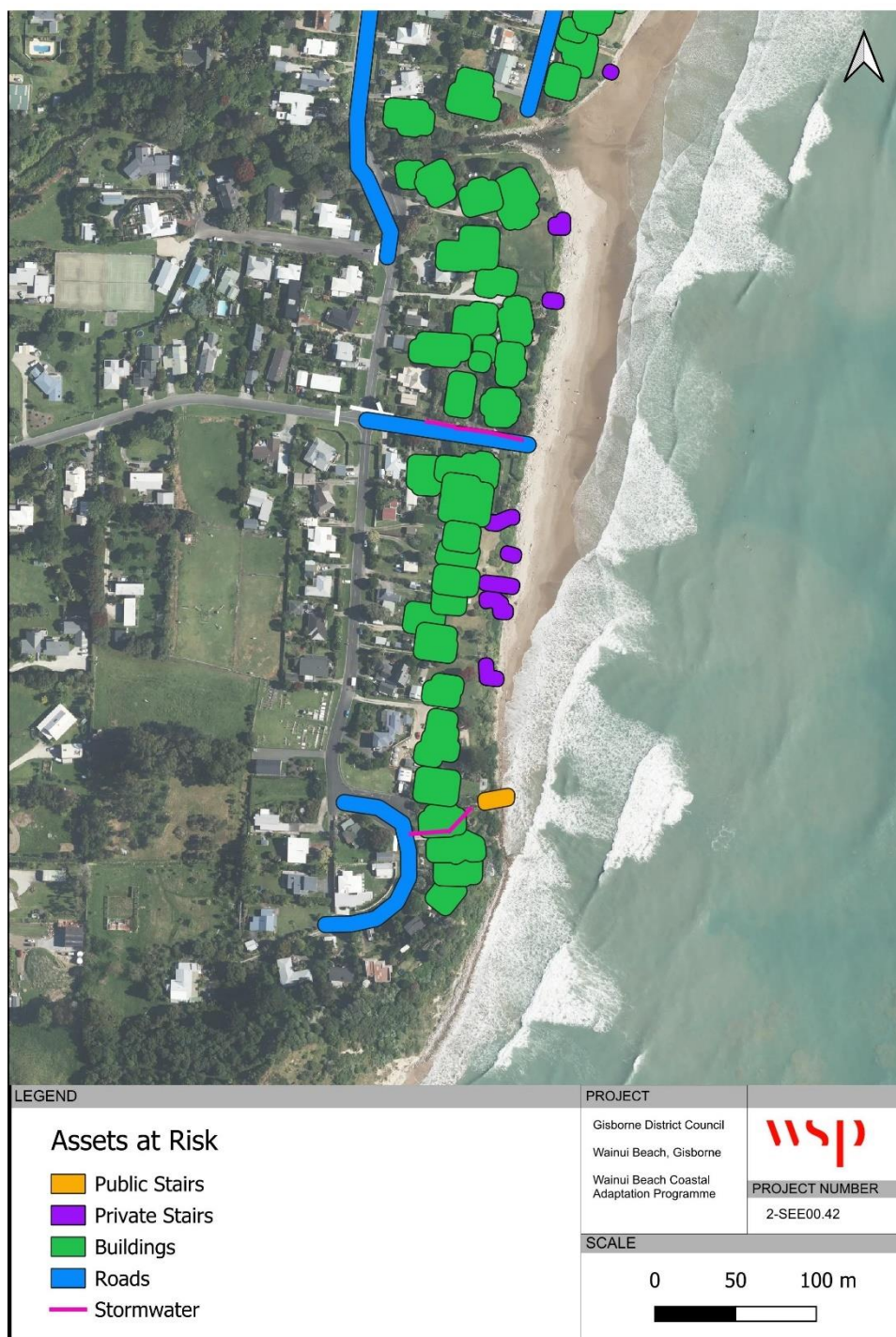


Figure 7-1 Map showing key assets at risk to coastal hazards in the Southern Section of Wainui Beach

COASTAL SETTING

The width of dry high tide beach reduces along the southern section as system migrates toward from beach to cliff coastal form. Within the embankments there are occasional exposures of the paleo estuarine or stream settings that has been discussed in prior reporting. This is most observed as a cohesive lightly cemented grey mudstone, known locally as grey pug (this is also found around Wainui Stream and the Central Section).

The entire stretch has some form of coastal protection structure, typically located toe of the raised dune and in some locations supporting retaining structures. The frequency of exposure of these structures increase as you move south, and those structures around Tuahine Crescent are typically visible.

RISK OF COASTAL HAZARDS

The most significant coastal hazard risk for the Southern Section of Wainui Beach are risks associated with coastal erosion hazards. The assets most at risk to coastal hazards along this section are buildings, private and public stairs, stormwater infrastructure and roads. A summary of the risks along the Southern Section of Wainui Beach in the short-term, medium-term and long-term are summarised in Table 7-1Table 4-1 below.

Table 7-1 Summary of risks associated with coastal hazards in the short-term, medium-term and long-term along the Southern Section of Wainui Beach

SHORT-TERM (5 TO 20 YEARS) VULNERABILITY TO COASTAL HAZARDS	In the short-term (5 to 20 years), 11 buildings, Lloyd George Road, all private stairs, and all public stairs in the Southern Section of the beach are at risk of the coastal hazards associated with erosion. One building, Lloyd George Road, six private stairs, and all public stairs are also at risk of coastal inundation. In the short-term, two buildings are at risk to fluvial flooding and there are no risks associate with cliff instability hazards
MEDIUM-TERM VULNERABILITY TO COASTAL HAZARDS	In the medium-term (20-50 years), 16 buildings, Lloyd George Road, all private stairs, and all public stairs in the Southern Section of the beach are at risk of the coastal hazards associated with erosion. One building, Lloyd George Road all private stairs, and all public stairs are also at risk to coastal inundation. In the medium-term, two buildings are at risk of fluvial flooding and there are no risks associate with cliff instability hazards
LONG-TERM VULNERABILITY TO COASTAL HAZARDS	In the long-term (50+ years), 29 buildings, Lloyd George Road and Tuahine Crescent, all private stairs, and all public stairs in the Southern Section of the beach are at risk of the coastal hazards associated with erosion. Three buildings, Lloyd George Road, all private stairs, and all public stairs are also at risk of coastal inundation. In the long-term Tuahine Crescent and 11 buildings are also at risk to cliff instability hazards and there are no risks associated with fluvial flooding.

ADAPTIVE PATHWAYS

The adaptive pathways for the Southern Section of Wainui Beach have been suggested due to their practicality, taking the beach sections current vulnerability to coastal hazards into consideration as well as any future increases in vulnerability due to SLR and climate change. The pathway anticipates

future community-level engagement and activities that GDC and the community should be aware of and consider contributing to as well.

SHORT-TERM PATHWAY AND MEDIUM-TERM PATHWAY

An Accommodate approach is recommended as the short-term and medium-term pathway for the Southern Section of Wainui Beach for the protection structures by maintaining to existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues with the existing protection structures.

Alongside this approach upper dune restoration/regeneration under the Protect approach is also recommended to help restore the existing dune systems along this section and provide an increased level of protection against coastal erosion.

LONG-TERM PATHWAY

A Protect and Managed Retreat approach is suggested as the long-term pathway of the Southern section of the beach due to the indicative future coastal hazards that this section of the coastline may experience. These approaches should be considered based on erosion and inundation triggers at the site-specific level.

These approaches are trigger-based and should begin to be considered when the mean high water neap position has been recorded at the toe of the dune escarpment for a period exceeding a year.

The short-listed adaptation options considered along the Southern Section of the Wainui Beach coastline are displayed below in Table 7-2.

Table 7-2: Short-listed adaptation options considered. Note: Refer to Section 2 for more detail on each option

		Options considered
Short-term	Do Nothing/ Business as Usual 	All current coastal hazard management activities continue. Continue business as usual maintenance on assets and continue current emergency management and environmental monitoring activities to existing level of service.
	Accommodate 	Accommodate existing protecting structures by maintaining to existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues associated with the existing protection structures. As best as practicable a uniform design shall be applied across all sites to ensure equitable performance and environmental outcomes/controls.
	Protect	Implement dune restoration and regeneration activities for the dune system along the Southern

		Section. It is recommended to use dune building species around the stream mouths and employ native planting strategies in the upper dunes to promote slope stability.
Medium-term	Accommodate 	Accommodate existing protection structures by maintaining to existing level of service using modern engineering practices. This will aid in mitigating any existing health and safety issues associated with the existing protection structures.
	Protect 	Implement dune restoration and regeneration activities for the dune system along the Southern Section. It is recommended to use dune building species around the stream mouths and employ native planting strategies in the upper dunes to promote slope stability.
Long-term	Protect 	Implementation of new and upgraded hard engineering option to new level of service to prevent future erosion and inundation of assets located directly adjacent to the coast in the Southern Section.
	Retreat 	Managed retreat of the buildings at risk to coastal hazards along the Central Section to new land parcel as there is no available land on the existing land parcels for properties to be relocated too.

8 INDICATIVE COSTINGS

The indicative costings are provided in the table below are based upon high level estimates and intended to be used to inform the adaptation planning process. Further design work would be required to enable an accurate assessment of the costs.

With respect to public access stairs the most cost-effective method would be to obtain a global design and consent for construction of stairs and accessways along the beach. This would represent an initial outlay of professional design and planning fees. However, this would allow for the gradual replacement of access points along the beach without individual consents and designs being required.

Costings associated with Business as Usual have been excluded as these processes are typically undertaken by Council.

Indicative dollar signs \$= 1000's, \$\$= 10,000's, \$\$\$= 100,000's and \$\$\$\$= 1,000,000's.

Table 3: Indicative costings for different adaptation options.

Section	Timeframe	Adaptation Option	Indicative Cost
Northern Section	Short Term	Public Stairs (per set)	\$\$
		Pines Carpark	\$\$\$
		Planting (assuming community program)	\$\$
	Medium Term and/or Long Term (depending on triggers)	Other Carparks (per carpark)	\$\$-\$\$\$
		Planting (assuming community program)	\$\$
Central Section	Short Term	Planting (per property)	\$\$
		Public Stairs (per set)	\$\$
		Maintain existing structures (per property)	\$\$
	Medium Term and/or Long Term (depending on triggers)	Increased protection measures (per section)	\$\$\$
		Managed retreat (including buy-out)	\$\$\$\$
Wainui Stream and Hamanatua Stream Sections	Short Term	Stream realignment (post consent being obtained and per alignment)	\$
		Public Stairs/Access (per site)	\$\$
		Maintain structures (per section)	\$\$
	Medium Term	Maintain structures (per section)	

	Long Term	Increased protection measures (per section)	\$\$\$
		Managed retreat (including buy-out)	\$\$\$\$
Southern Section	Short Term and Medium Term	Maintain structures (per section)	\$\$
		Planting (per property)	\$\$
		Public Stairs/Access (per site)	\$\$
	Long Term	Increased protection measures (per section)	\$\$\$
		Managed retreat (including buy-out)	\$\$\$\$

9 CONCLUSION/NEXT STEPS

This report detailed the adaptation pathway planning options for the most vulnerable areas for each coastal section along Wainui Beach to coastal hazards. The information compiled within this document is intended to provide GDC with guidance on adaptation options for specific sections of the coastline with respect to rising sea levels associated with future climate change. They are intended to support conversations and engagement with the community to further refine the preferred pathways and triggers for each adaptation options.

10 REFERENCES

GDC Tairāwhiti Resource Management Plan Map (Tairāwhiti Maps) online GIS viewer. https://maps.gdc.govt.nz/H5V2_12/Index.html?viewer=TairawhitiPlan, accessed January 2024

WSP. (2023). Wainui Beach Coastal Hazard Assessment Report, prepared for Gisborne District Council.

WSP. (2024). Wainui Beach Coastal Risk Assessment Report, prepared for Gisborne District Council.

11 LIMITATIONS

This report ('Wainui Coastal Adaptation Pathway Planning') has been prepared by WSP exclusively for Gisborne District Council ('Client') in relation to Wainui Coastal Adaptation Pathway Planning ('Purpose') and in accordance with Statement of Work Supplier Panel Document dated 04/04/2023. The findings in this Report are based on and are subject to the assumptions specified in the Coastal Adaptation Pathway Planning. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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