PLANNING COMMITTEE – 29 APRIL 2026

REPORT FOR DECISION

MOUNTS BAY COASTAL RESILIENCE STRATEGY CONSULTATION

Our Culture	Our Decision Making	Our Environment	Our Money	Our People	Our Places	Our Resilience & Wellbeing
						
		✓				✓

Recommendation:

Consideration be given to the Mounts Bay Coastal Resilience Strategy, as set out at Appendices 1 and 2 to this report, and, if necessary, a response be provided to Cornwall Council's consultation exercise.

Background:

Cornwall Council and the Environment Agency have developed a joint strategy to manage flooding and coastal erosion risks in Mounts Bay. The Strategy has three aims:-

- To provide a long term structure for flood and coastal erosion risk management.
- To inform and guide other initiatives in the area to develop in a sustainable manner, considering risk management plans.
- To ensure coordinated investment across the bay. Identify potential synergies between organisations and opportunities to work together.

The Strategy incorporates a number of studies completed in the area over the past ten years. It analyses all available management options to find a preferred approach for the future and gives an overall plan for the whole bay. The Strategy includes:-

- Maintaining existing defences around the harbours and Mousehole coast road;
- Implementing sandscaping around Eastern Green and Longrock;

- Building control structures to protect Penzance promenade;

- Controlled setback of defences in western Marazion and Tolcarne, gradually moving the defence inland in a managed way; and

- Incorporating nature based solutions where possible. Examples include around the Lariggan Valley and Foster Bolitho Gardens.

Cornwall Council is now consulting on the Strategy, which is set out as an Appendix to this report alongside its summary document, and the Committee may therefore wish to consider providing a response on behalf of Penzance Council.

Appendix 1 – Mounts Bay Coastal Resilience Strategy Summary Document
Appendix 2 – Mounts Bay Coastal Resilience Strategy

Elliot Ridington
Democratic Services and Governance Officer

CORNWALL COUNCIL
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The Mounts Bay Coastal Resilience Strategy

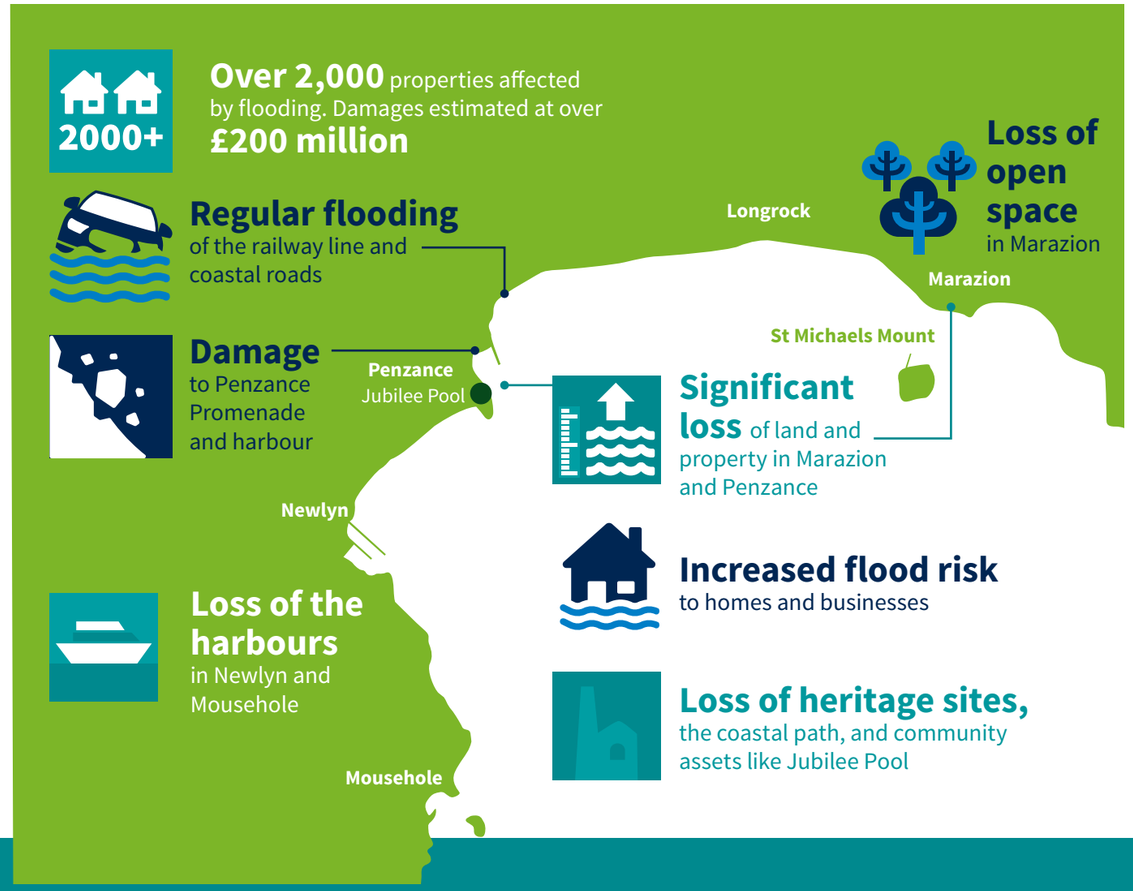
www.cornwall.gov.uk/climateadaptation

Why do we need a coastal resilience strategy for Mounts Bay?

Mounts Bay is a beautiful and vital part of Cornwall. It's home to thriving communities, historic harbours, popular beaches, and important natural habitats, across 15.5km of coastline. However, the coastline faces growing challenges from the sea. Interventions to manage this risk must also consider the significant flood risks in the area. Without action, many of the things we value here could be lost. Lots of the defences in Mounts Bay are ageing and in poor condition. Some are patched up after storms, but this "do minimum" approach is unsustainable and not cost-effective. Rising sea levels and more extreme weather will also put existing defences under increasing pressure. This will put homes, businesses, roads, and railways at risk.

By 2050, without action, we could see:

By 2100, impacts could be more severe:



The Mounts Bay Strategy aims to help protect the area from flooding and coastal erosion. It looks ahead over the next 100 years. It aims to guide how we manage the coast in a way that's sustainable, coordinated, and works for both people and nature. The Strategy will help us take a proactive approach, rather than reacting to damage. We want to make informed decisions about where and how to invest resilience. The strategy allows Cornwall Council, the Environment Agency, and other partners to work together to achieve this. It also helps us:

- Work together on a long term, coordinated approach across the bay.
- Work with communities, organisations, and voluntary groups to find balanced solutions.
- Inform and guide other initiatives in the area, like place-making

National and regional policies have shaped this work, including:

- National Flood and Coastal Erosion Risk Management Strategy
- Cornwall & Isles of Scilly Shoreline Management Plan
- the Environment Act.

Locally, it aligns with:

- the Cornwall Environmental Growth Strategy
- the Cornwall Maritime Strategy
- the Penzance Neighbourhood Plan

Key objectives

To support the social and economic viability of coastal settlements.

To reduce the impact of coastal erosion and flooding on infrastructure.

To minimise the impact of coastal erosion and flooding on community and visitor assets.

Maximise potential to support diversification of tourism, recreational and other economic opportunities.

To minimise health impacts resulting from coastal erosion and flooding.

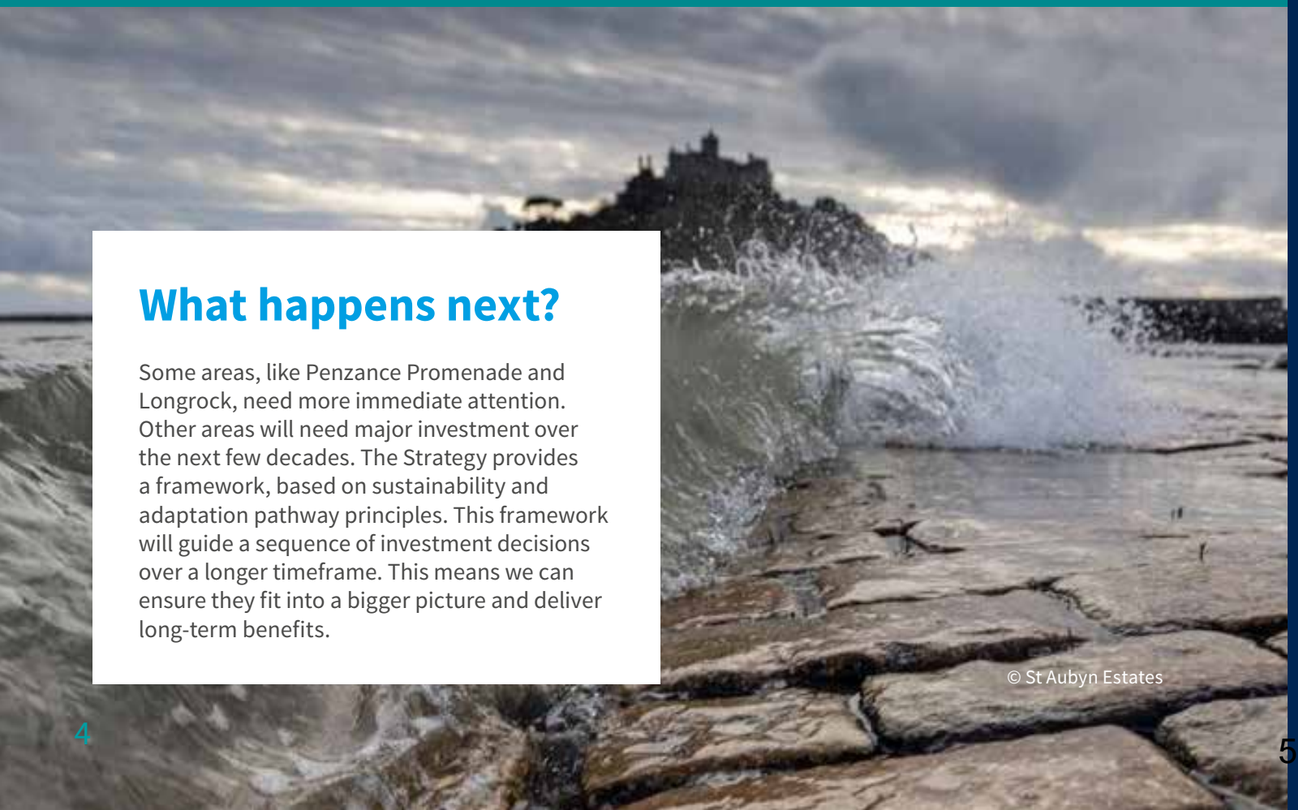
To support achieving 'good ecological status' for the freshwater and marine environment.

To work with natural and geomorphological processes where possible.

To conserve, protect and enhance designated and non-designated heritage assets and their settings.

To protect and enhance the high quality natural landscape and seascape.

To protect and enhance biodiversity. To support existing habitats to adapt to climate change, where possible.



What happens next?

Some areas, like Penzance Promenade and Longrock, need more immediate attention. Other areas will need major investment over the next few decades. The Strategy provides a framework, based on sustainability and adaptation pathway principles. This framework will guide a sequence of investment decisions over a longer timeframe. This means we can ensure they fit into a bigger picture and deliver long-term benefits.

What is the Shoreline Management Plan?

The Shoreline Management Plan (SMP) guides management of coastal change in England. It sets out the approach to manage each area of coastline until 2105. It aims to protect people, property, and natural habitats while adapting to coastal change. The SMP guides decisions and funding for coastal defences and resilience. Areas are categorised into one of three policies:

- **Hold the line:** invest in maintaining or upgrading the protection from defences or natural coastline features.
- **Managed realignment:** invest in active management of coastal processes to realign the 'natural' coastline. Aim to create a sustainable shoreline position.
- **No Active Intervention:** do not invest in new defences or maintenance. Allow the coast to evolve naturally.

What does 'sustainability' mean for Mounts Bay?

According to the United Nations, 'sustainability' means 'meeting the needs of the present without compromising the ability of future generations to meet their own needs.' There are existing issues in Mounts Bay, where current residents need better solutions to reduce the impact of extreme weather on daily life. The strategy also needs to balance the needs of future residents, for example through:

- Recommending measures that support opportunities for place shaping, nature recovery and economic regeneration for current and future residents
- Maximising use of natural processes, making sure humans and nature work together
- Not committing future generations to an expensive legacy of defences, that are unsustainable and difficult to maintain
- Investing early, to reduce costs in future, where possible

Background to flood and coastal risk management in Mounts Bay

Around 14.5km of the Mounts Bay coastline is currently protected by hard sea defences. Many of these defences have been in place for over a century. They include harbour walls, promenade structures and railway embankments. Some of the earliest defences date back to the 1800s, including Newlyn and Penzance harbours. Defences have also protected the railway line since its construction in the 1850s. Many of these structures need frequent repairs, especially after major storms. This work is often reactive, fixing damage after it happens, rather than part of a long-term plan. Today, only a few areas of natural shoreline remain. One example is Marazion Dunes, which protect the low-lying Marazion Marsh (but even here the coast is artificially constrained by the highway behind the dunes). The rest of the coast is heavily shaped by hard engineered defences.

While the defences help protect homes, businesses, and infrastructure, they also create challenges. Over time, they can separate people from the sea, reduce beach area, and make it harder for the coast to adapt naturally. As sea levels rise and storms become more intense, maintaining these defences becomes more technically difficult and expensive. This maintenance can require higher and stronger defences. These changes further impact the landscape and environment. This approach is limiting the needs of both current and future generations.

How did we identify a preferred option?

Previous studies → Long list → Strategic Approaches → Preferred option

The strategy evaluates the wide range of studies and detailed local assessments. These have been completed in Mounts Bay over the last 10 years. From this evidence, we created a long list of options for each area. We combined complementary actions to build four potential strategic management approaches. Each approach considers the implications of each option across the bay. These strategic management approaches aim to define a framework for management. Implementing individual projects within it will need more detailed analysis.

We evaluated each approach using criteria identified from the strategy objectives. These criteria made it easier to identify which approach provided the most benefits. Based on this analysis, option four is the preferred option. The criteria used were:

Economic

- Minimise economic losses
- Adaptation and resilience
- Commercial infrastructure
- National, regional and local connectivity infrastructure
- Visitor numbers
- Opportunities for tourism diversification

Flood and coastal erosion risk management

- Impact on natural processes and geomorphology
- Adaptive capacity
- Unlocking barriers to development and growth

Nature

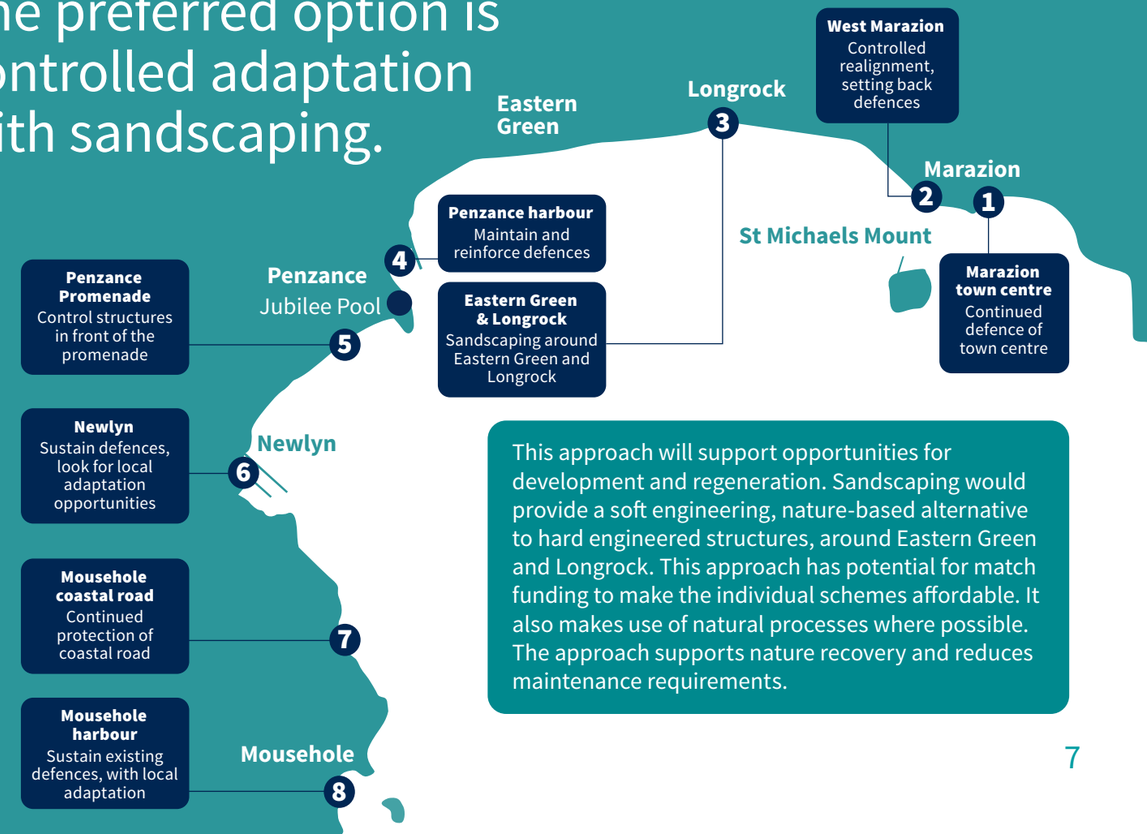
- Freshwater and marine ecological status
- Existing habitat biodiversity
- Opportunities for biodiversity adaptation and resilience
- Greenhouse gas emissions

Health and security

- Access to recreation and amenity assets
- Safety and security
- Wealth inequality
- Landscape recreation and amenity value
- Heritage

What is the preferred option?

The preferred option is controlled adaptation with sandscaping.



This approach will support opportunities for development and regeneration. Sandscaping would provide a soft engineering, nature-based alternative to hard engineered structures, around Eastern Green and Longrock. This approach has potential for match funding to make the individual schemes affordable. It also makes use of natural processes where possible. The approach supports nature recovery and reduces maintenance requirements.

What would the preferred option mean for my area?

Marazion

SMP policy: Hold the Line around Marazion town, marsh and St Michael's Mount harbour. No Active Intervention around St Michael's Mount.

Action needed in: 10 years for Marazion Marsh, 20 – 30 years in Marazion

Key vulnerability: Saltwater intrusion at Marazion Marsh, erosion of seafront properties in Marazion

Marazion is an historic coastal town with strong cultural and environmental significance. It's a designated conservation area, a gateway to St Michael's Mount, and home to Marazion Marsh, a Special Protection Area (SPA). A mix of old sea walls and defences behind the beach protect the town. These are increasingly under pressure from rising sea levels and erosion.

What does the preferred option involve?

- **Continued defence of the town centre:** Maintain existing defences to protect property, heritage, and infrastructure.
- **Controlled realignment in the western end of Marazion:** Setback defences, to allow the coast to evolve more naturally. This helps reduce long-term pressure on the shoreline and creates space for nature.
- **Sandscaping at Longrock:** Add sediment to the beach further west. Natural processes will help transport sand towards Marazion. This will increase beach width, support the growth of Marazion Dunes, and improve flood resilience

Considerations

In Marazion, the strategy needs to balance protection of the town with opportunities for natural processes. In the core town, properties sit just behind defences but in the western part of Marazion, there is more scope for an adaptive approach. While the proposed approach offers long-term benefits, it will bring noticeable changes to the landscape. There are potential environmental impacts, such as:

- windblown sand affecting Marazion Marsh
- smothering of lower beach areas.

These impacts will need careful assessment and management. However, there will also be environmental and recreational benefits including:

- A wider upper beach and restored dunes will enhance the County Wildlife Site
- Increased opportunities for beach use
- Improved connection between the town, the shoreline and the coast path.

Eastern Green & Longrock

SMP policy: Managed realignment

Key features: railway line and A30 road

Action needed in: 10 – 15 years

The Eastern Green and Longrock area is home to vital transport infrastructure. It's also seen as an important location for commercial development and economic regeneration. A continuous embankment, reinforced with hard sea defences, currently protects the shoreline. The South West Coast Path runs along the top of this embankment. These defences protect the area, but limit the natural development of the shoreline.

What does the preferred option involve?

- **Sandscaping:** One-off placement of large volumes of sand along the beach to build up natural protection. This approach works with natural processes, allowing sediment to gradually spread across the area.
- **Support wider coastal system:** Sand placed here will also help restore dunes and improve flood protection in Marazion.

Considerations

This option will bring noticeable changes to the landscape, especially when the sand is first placed. However, over time, the beach will evolve, and the overall character of the coastline will be preserved. We expect sandscaping to last around 35 years before needing a smaller top-up (about 40% of the original volume). Early studies suggest we could source the sand locally. This would reduce transport costs and the carbon footprint of the project. Rather than trying to hold sand in one place, the strategy encourages its natural movement across the bay. This helps maintain the long, uninterrupted sweep of shoreline. It supports a more flexible, nature-based approach to coastal management.

This area and Marazion West are closely linked. Sandscaping could tackle immediate issues in this area and provide longer term benefits to Marazion. Managing environmental impacts will need careful planning, such as changes to beach habitats or effects on nearby protected areas. Overall, this option offers a viable, low-carbon, and medium to long-term solution. It:

- protects key infrastructure
- supports regeneration
- works with nature rather than against it.

In the long-term, beyond 2055, we may need a different approach but this option gives us time to plan for this.

Penzance Harbour

SMP policy: Hold the line

Action needed in: in the next 10 years for South Pier, by 2060 for surrounding area

Key features: railway station, employment hub, listed structures e.g. harbour

Penzance Harbour is a vital part of the town's identity and economy. It's a:

- key local employment centre
- home to historic listed structures
- central focus for regeneration in the Penzance Neighbourhood Plan.

A mix of sea walls, piers, and extensive rock armour protect the harbour. Its management is closely related to neighbouring areas. The rocky outcrops of Battery and Chimney Rocks provide natural resilience to Penzance Harbour. The strategy supports making use of this hard local geology. However, sea level rise will continue to increase pressure in future.

What does the preferred option involve?

- **Maintain and reinforce existing defences:** Strengthen the harbour's current defences.
- **Improve visual integration:** Where possible, adapt defences between the harbour and the Promenade. Aim to reduce visual impact and better integrate the structures into the landscape.

Considerations

The strategy assumes that the harbour will continue to play an important economic role in the future. Thus, the proposed works aim to ensure it remains functional and resilient. Sea level rise will pose challenges to this goal. Over time, defences will need to be raised and extended further onto the foreshore as beach levels drop. Despite the focus on sustaining the harbour's defences, some local adaptation is also required. This adaptation will limit changes to the coastal environment.

The preferred option offers a practical and deliverable way to protect Penzance Harbour. It balances flood resilience with heritage conservation and visual sensitivity. It supports the town's regeneration goals while maintaining the harbour's role as a working and cultural asset.

Penzance Promenade & Wherrytown

SMP policy: Managed realignment

Action needed in: next five years on the Promenade, by 2050 for Wherrytown. There are benefits to working across the whole area in parallel, if funding allows.

Key features: Promenade, Jubilee Pool, Lariggan Valley

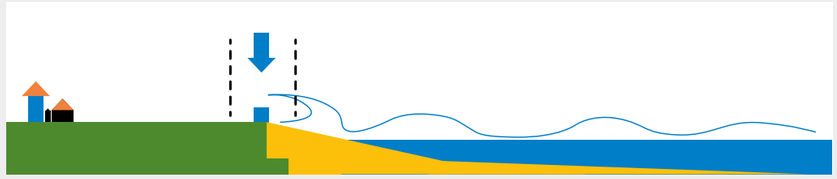
Penzance Promenade and Wherrytown form the heart of the town's seafront. This area is a key centre for commerce and employment. It includes important features such as the Jubilee Pool, the South West Coast Path, and the Lariggan Valley. It's also an important coastal route for vehicles and pedestrians.

What does the preferred option involve?

- **Control structures in front of the Promenade:** Build structures to reduce wave energy and overtopping. These will allow for a more varied and integrated approach to coastal defence.
- **Renaturalisation of the Lariggan Valley:** Increase the area's capacity for flood storage. Renaturalisation reduces flood risk in a more environmentally sensitive way. It is also more sustainable because it works with natural processes and reduces maintenance requirements.
- **Submerged breakwaters at Foster Bolitho Gardens:** Redesign the area and create submerged breakwaters. Maximise nature recovery opportunities on these structures.

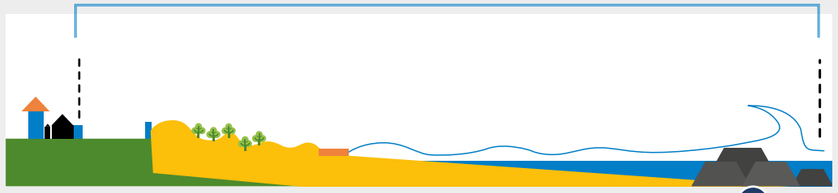
Present Day:

Most risk management occurs over a narrow, static zone, with steepening sediment denuded beaches.



Envisaged future approach:

Risk managed over a wider, more flexible zone, with shallower, sediment nourished beaches and upper shore dunes or modified promenade structures.



Considerations

While the proposed changes will alter the landscape, they offer opportunities to enhance the area's use and appearance. The varied approach to defence supports long-term resilience but avoids locking the town into rigid infrastructure. It also aligns with local aspirations for regeneration and improved public spaces. This means we can maintain and improve what people like about the area for future residents. Underwater structures would be designed to maximise nature recovery opportunities. An example is using eco-blocks, which encourage habitat establishment on the structure.

There is little justification for maintaining existing defences along Foster Bolitho Garden. However, this space has high community value. The strategy proposes ways to mitigate impacts through redesign and improved beach connectivity. This approach would create a wider upper beach and a better transition between the sea and the open grassed space behind. Continuing to protect the road behind the gardens would maintain access routes.

The preferred option allows for a softer, more natural reshaping of the coastline. This will create a more attractive and adaptable seafront for residents and visitors.

Newlyn & Tolcarne

SMP policy: Hold the line

Action needed in: 15 years at Tolcarne, by 2050 in Newlyn

Key features: Newlyn harbour, heritage features

Newlyn is a historic and economically important coastal town, home to one of the largest fishing fleets in the UK. The harbour plays a vital role in both the local economy and flood protection. The area is also a designated conservation zone and includes cultural landmarks such as the Newlyn Art Gallery. Despite these strengths, Newlyn experiences significant social and economic challenges. Tolcarne is more exposed and has different management needs but is fundamentally linked to Newlyn in terms of coastal risk.

What does the preferred option involve?

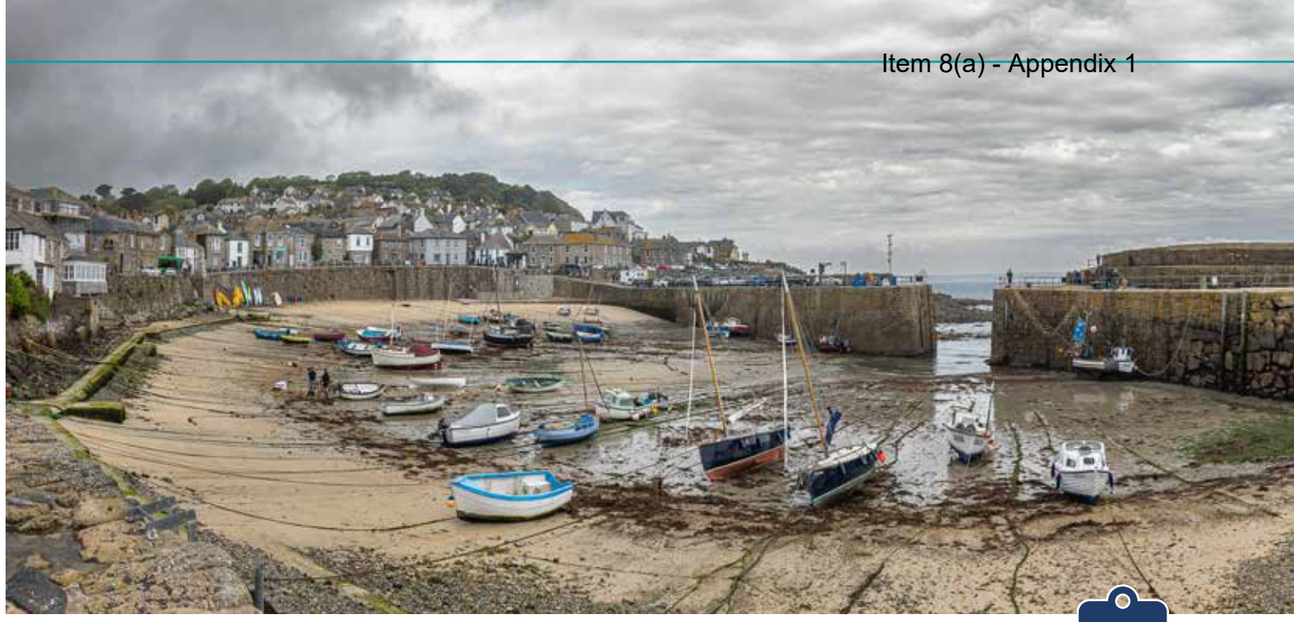
- **Sustain existing defences in Newlyn:** Maintain and improve the harbour's current defences. These defences are essential for safeguarding the lower-lying areas behind the harbour.
- **Local adaptation opportunities:** Use opportunities for some localised adaptation, particularly around the entrance to the Newlyn Coombe River.
- **Adaptive management at Tolcarne:** Take a more flexible, controlled realignment approach. Gradually move the frontline of defences at Newlyn Green inland in a managed way.

Considerations

The preferred option for Newlyn and Tolcarne supports long-term protection of vital assets. It also allows for more flexible and responsive management, where possible.

Newlyn's rocky coastal setting limits opportunities for large-scale nature-based solutions. However, recent pilot work on the Tolcarne breakwater demonstrated how nature-inclusive engineering can provide positive, if modest, benefits, even within a strategy relying predominantly on hard, static defences. The town's historic layout and tightly packed buildings constrain space for realignment. The harbour provides a dual role; protecting the town and supporting economic activity. Continuing to maintain the harbour meets multiple strategy objectives.

At Tolcarne, adaptive management offers a more sustainable way forward. This approach allows the area to adapt to changing conditions while still maintaining protection for key infrastructure and properties. It will require careful planning and community engagement for a smooth transition.



Mousehole

SMP policy: No active intervention at Sandy Cove, hold the line along Cliff Road and in Mousehole

Action needed by: 15 years on the coast road, 20 years in Mousehole

Key features: Mousehole harbour, coastal road

Mousehole is a historic fishing village with deep cultural and heritage value. The grade II listed harbour remains the heart of the village, even though the fishing industry has declined. The harbour structure's role providing shelter to the community from storms and reducing flood risk remains central to the proposed approach.

Most of Mousehole lies within a conservation area. The surrounding coastline includes two Sites of Special Scientific Interest (SSSIs). Rocky terrain constrains the village's boundaries. This landscape limits opportunities for large-scale environmental enhancements. Recent collapses on cliff road highlight the need for a sustainable approach here.

The focus is on **preserving** existing defences, with small **improvements** where possible.

Considerations

Mousehole's rocky setting and historic layout has limited space for major redesign. The focus is on preserving existing defences, with small improvements where possible. These defences provide multiple benefits, including flood protection, cultural identity, and economic value. The approach aligns with the area's Shoreline Management Plan policies. It recognises the importance of

- protecting access routes
- maintaining the character of the village
- allowing nature to take its course in less vulnerable areas.

What does the preferred option involve?

- **Sustaining existing defences:** Maintain the current defences that protect properties behind the harbour.
- **Continued protection of the coastal road:** Several points on the Newlyn to Mousehole coast road are already protected. The strategy supports continued defence at these locations, to maintain access to Mousehole.
- **Local adaptation and greening:** This could include "greening" existing hard structures. This greening makes them more visually and environmentally sympathetic.
- **Natural response in undefended areas:** Allow the cliff line to evolve naturally in places where there are currently no sea defences.

Alternative options considered

The strategy shortlisted three other strategic approaches for Mounts Bay. Each had strengths but overall did not perform as well as the preferred option. For further details of the alternative options, please see the full strategy. The table below provides a summary of all four options.

Option	Key features	Flood and coastal erosion risk management	Economy	Health and security	Nature
1 **Do Nothing**	Ruled out due to negative economic and social consequences. Flooding and erosion would severely limit regeneration and place shaping. Also risks saltwater intrusion at Marazion Marsh.	-	---	--	--
2 **Sustain existing protection**	Sustain existing defences and management across the bay. This approach will become increasingly expensive and less effective as sea levels rise.	----	--	-	-
3 **Controlled adaptation**	Creates opportunities for more flexible ways to protect the area and more integrated across the bay. Maintain existing defences in key areas, investigate adaptation where possible.	+	+++	++	+
4 **Controlled adaptation with sandscaping (preferred option)**	As outlined in the strategy, builds on option 3, taking a more integrated approach by using sandscaping in the eastern side of the bay.	++	+++	++	++

Next steps

For the public...

Let us know your views on the proposed approach through the **Let's Talk Cornwall survey**.

Support applications for planning permission for individual schemes.

For the Council...

Work with stakeholders to **secure support** and **identify options** for joint funding.

Start **detailed design** for projects needing action in the short term.

For advice and guidance, please visit:

www.cornwall.gov.uk

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email: customerservices@cornwall.gov.uk
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call: 0300 1234 100

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REPORT

Mount's Bay Coastal Strategy

Main Strategy –Draft Final

Client: Cornwall Council

Reference: PB9249-ZZ-XX-RP-Z-0002
Status: Draft/00
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Enhancing Society Together

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00	06.09.2021	Draft for Client Review	Greg Guthrie	Ian Ball	Mark Young
00	30/07/2022	Draft Final	Greg Guthrie	Ian Ball	Mark Young

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1.1 Background

1.1.1 Risk Management Context

The Mount's Bay Strategy covers the area from Mousehole through to just to the east of Marazion and includes the main settlement areas of Mousehole, Newlyn, Penzance and Marazion (Figure 1.1).

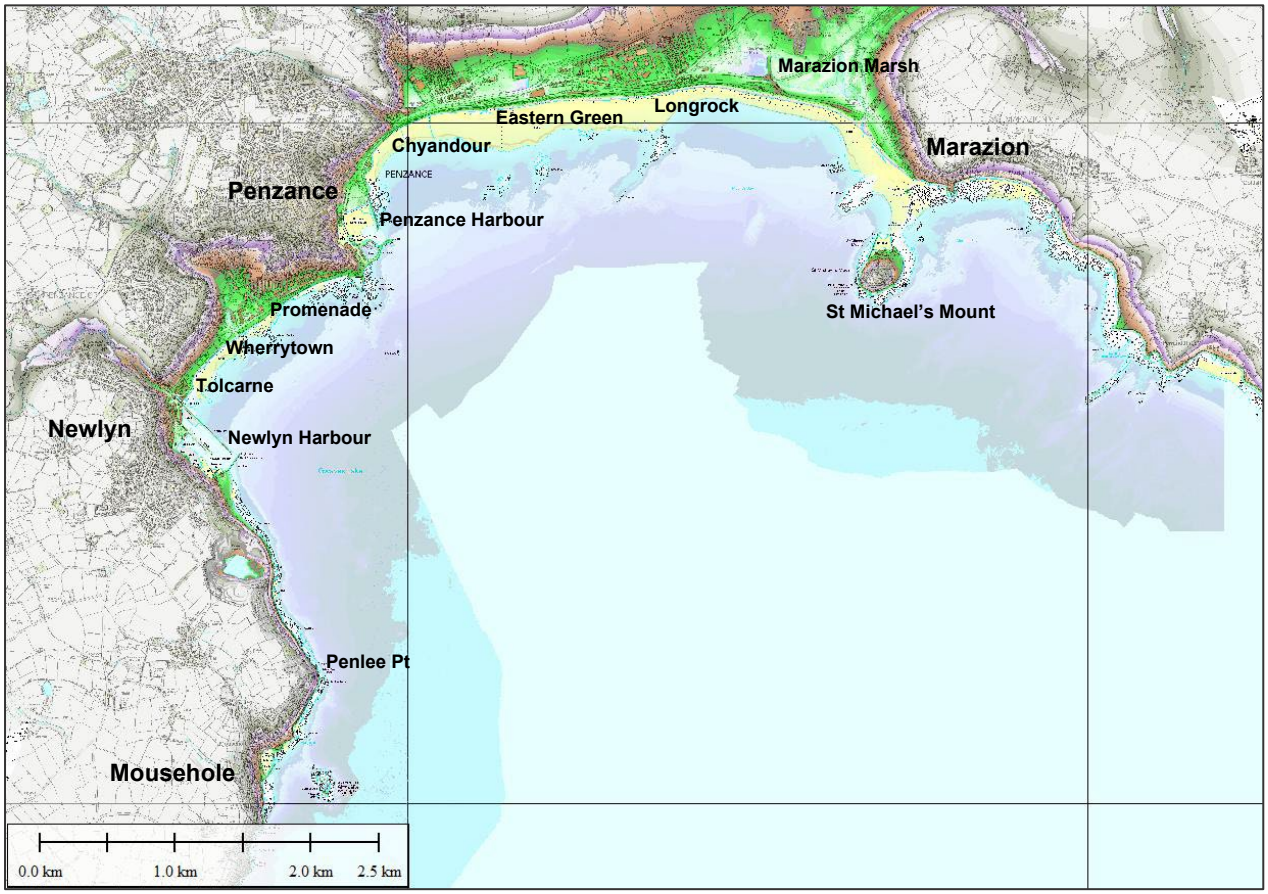


Figure 1-1. Mount's Bay Strategy Area

There are currently concerns over the condition of many sections of defence, with the recognition, identified within the Shoreline Management Plan (2011[1]), that the pressure on defences will increase and their effectiveness against wave overtopping will diminish in different areas over the short, medium and long-term with sea level rise.

Building from the baseline and concerns raised and defined by the SMP, Cornwall Council and the Environment Agency have been taking a collaborative and progressive approach to examining different areas and aspects of the frontage. Particular attention, initially, had to be given to areas of greatest concern, alongside the two areas of the Promenade and Eastern Green/ Longrock, where the SMP identified the potentially greatest need for adapting the existing approach to management. Alongside this,

[1] *An initial review was undertaken of the Cornwall and Isles of Scilly SMP in 2016, with further examination undertaken as part of the SMP refresh project in 2021. In both of these reviews it was noted that the Mount's Bay Strategy would provide further clarification, as provided in Section 7.4.2 of this current document.,*

more immediate works have been needed to be undertaken in areas such as between Wherrytown and Tolcarne, following damage to the existing defence in 2014, and at Longrock, in addressing short term concerns in this area. As local works have been undertaken, these works have benefitted from the emerging higher level studies, which have assisted in providing an initial strategic context.

This recognises that coastal management and engineering response, in particular to the impact of major storms, is an on-going process. This emphasises the clear need, now, for a far more comprehensive strategic approach across the larger Mount's Bay area, such that future works may be progressed in a co-ordinated manner, with the confidence that such works do not constrain the opportunity for change, delivering a more sustainable overall approach.

Further work, in terms both of work on the ground and studies, has been undertaken, in development of the Water Level Management Plan for Marazion Marsh, in considering the current flood risk around the Newlyn Coombe area and in terms of detailed modelling studies of potential options for the Eastern Green/ Longrock frontage. This has all contributed to the improved evidence base covering the area, all of which needs to be drawn together. The expanded evidence forms the basis for the development of the Mount's Bay flood and coastal erosion risk management (FCERM) Strategy, taking account of the broader issues around regeneration and sustaining and enhancing the important natural and built environment.

1.1.2 Longer term historic perspective

Much of the area has been defended since the early to mid-1800s, with defences in some areas dating back earlier than this. Major developments of the two main harbours, Newlyn and Penzance, were undertaken in 1885 and between around 1809 and 1853, respectively. Defences to the railway line to the east of Penzance were put in place at the time of construction of the railway during the 1850s, being extended around the turn of the century.

The Promenade wall to the west of Penzance was in place around the 1850s, with improvement made in 1895, and The Jubilee Pool was constructed at the eastern end of the Promenade in 1935.

Progressively, further defences have been put in place, such as along vulnerable sections of the coastal road through to Mousehole, over lengths of the railway in front of Eastern Green and Longrock during the earlier part of the twentieth century and more recently to the western part of Marazion. All these defences have required significant maintenance and repair works, most recently following the major storms of 2014. This has tended to have been undertaken in a relatively ad hoc manner driven by need and failure or risk of failure of defences.

At present, the only areas of natural shoreline occur along lengths of rock outcrop along the road to Mousehole and along the stretch of the Marazion Dunes, fronting the low lying land of Marazion Marsh.

The construction of defences have had both a significant influence on the development and use across the whole frontage but also on the ability of the shoreline to adapt and adjust over time.

1.1.3 Broader context

Clearly with the present defences and other coastal infrastructure so embedded within the existing landscape, the way in which the future approach to FCERM develops will strongly influence and potentially provide new opportunities for the way in which the use of the area develops or may be developed. This applies in relation to aspects such as regeneration, the cultural, visual and historic landscape and the natural environment.

Work is well advanced on developing Neighbourhood Development Plans, integrating this as an overall vision for how the seafront might be improved and used across the whole area, reconnecting the wider area with its shoreline. Associated with this, there has been consideration of options for developing and regenerating the use of the two main harbour areas. This forward looking ambition has been mirrored by improvement plans for use of the Coast Path linking from Marazion through to Mousehole and, more specifically, in the major investment in the Jubilee Pool (2016) at the Headland to the eastern end of the Promenade.

Underpinning this, however, is the recognised need for change. This is captured by:

- the Cornwall Council's Strategy for Environmental Growth (Cornwall Council 2016): "*not just protecting what we have left but reversing decline (environmental growth) so that the environment can continue to supply us with clean air, clean water, food, and other resources and services, including wonderful outdoor experiences*" and
- within Cornwall's Strategic Economic Plan: *"Our vision is a thriving and vibrant Cornwall and Isles of Scilly economy, with greater local autonomy, benefiting from our vast local assets and innovating our way into global markets: A unique blend of 'people and place' where the environment is valued both as a business asset and an inspiration for life."*

Reconciling the need for change alongside sustainable development presents a complex problem involving a wide range of stakeholder interests. The Mount's Bay coast is an essential asset and a platform for regeneration and growth, incorporating both the need for on-going risk management and the way in which this influences use of the area. Coastal change is an on-going process, which will increase with climate change, driven largely by sea level rise. This will intensifying pressures on the coastal environment. There is, therefore, the need for careful, critical thinking about how all stakeholders in a place work together to integrate and optimise the use of space and how investment provides a vibrant environment, with resilient social and economic outcomes. This broader intent requires an integrated approach to future management across the whole area.

1.2 Purpose and Structure of this Strategy Report

1.2.1 Report Purpose

While the primary purpose of, and need for this Strategy is in defining the overall approach to FCERM, from present day through to the future (nominally over the next 100 years), it also aims to provide a strong risk management framework, taking account of other interests and initiatives driving management from a broader perspective:

- Providing a coherent long term structure for FCERM, allowing and ensuring that more detailed examination and development of local schemes or measures can be progressed in the confidence that they fit within the broader picture.
- Informing and guiding other initiatives in a sustainable manner with due regard to management of risk in an area.
- Ensuring that investment is delivered in a co-ordinated manner, recognising the important role played by different stakeholders, identifying potential synergies and interdependencies, supporting the development of partnership approaches.

Critical to the approach being taken to development of the Strategy is the recognition that management is on-going. Even during the process of developing the Strategy, further local work and studies have been progressed. The development of the Neighbourhood Plans is an on-going process, with further local consultation and engagement with the public. Future plans with respect to improvements to both the main harbours are continually being re-assessed as new ideas are discussed and as the needs for

maintenance and improvements to harbour structures are re-assessed. Further work has been undertaken in resurfacing the promenade and in progressing the development of local improvement works in locations such as at the mouth of the Newlyn Coombe River, and further work has been undertaken to investigate features, such as the extent of sea grass, within the Marine Conservation Zone (MCZ).

This highlights the importance of considering management as a live process, within a developing environment; the need for on-going management cannot be put on hold. As far as possible, further information has been fed into the Strategy development process as further information has emerged.

1.2.2 Report Structure

1.2.2.1 Overview of report development and structure

The process of Strategy development is explained in Figure 1-2, highlighting where discussion is included in the report.

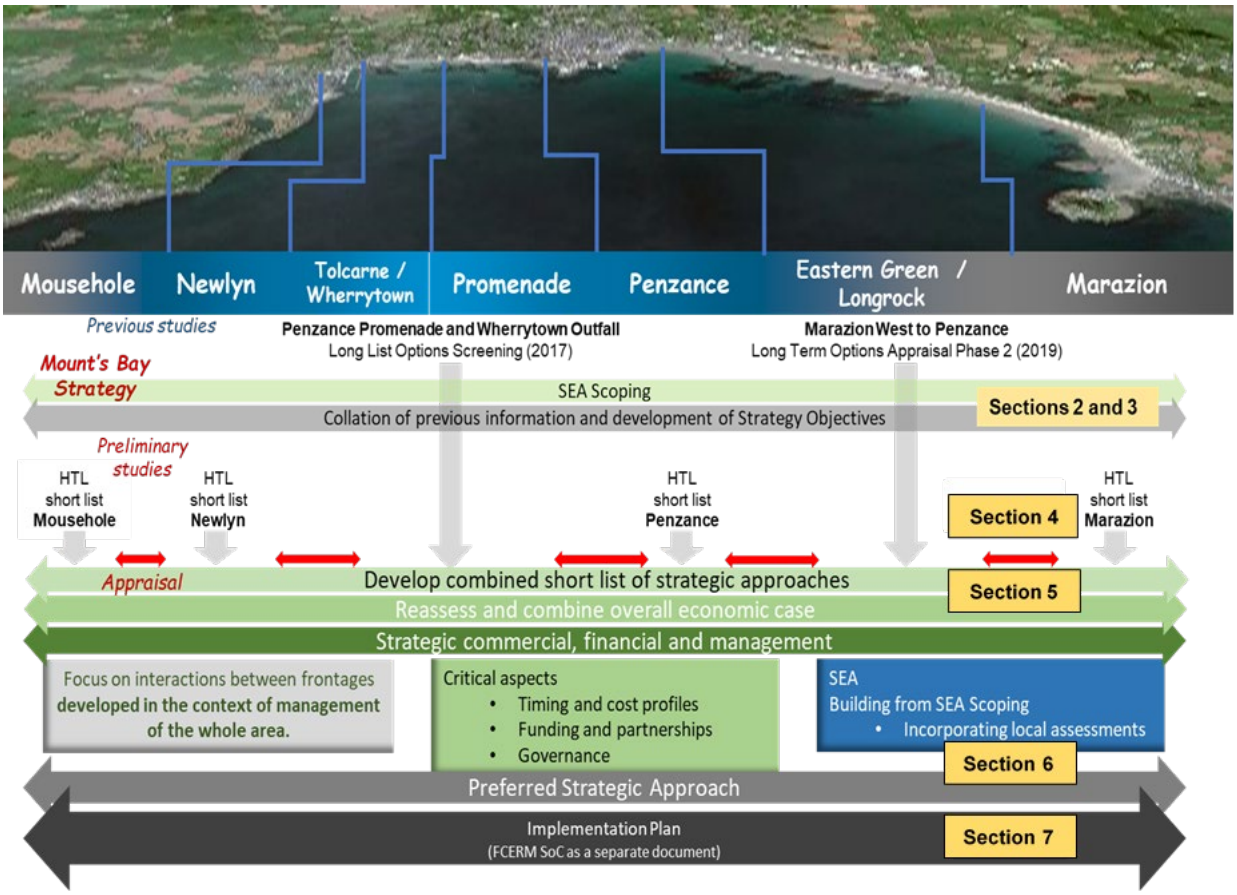


Figure 1-2. Schematic representation of development of The Strategy

Previous studies at Penzance Promenade and Wherrytown Outfall (from 2017) and Marazion West to Penzance (from 2019) have been brought into the Strategy development, along with other relevant existing information. These were used to inform new work on SEA Scoping and the development of strategic objectives, which are reported in Sections 2 and 3, with the problem and need for change being considered in Section 4.

Preliminary studies during the Strategy's development identified short lists of Hold the Line (HTL) options for Mousehole, Newlyn, Penzance and Marazion (Section 5) which have been combined with outputs from the previous studies to develop a combined short list of Strategic Management Approach options for the Strategy frontage.

Reassessment and combination of an overall economic case has been undertaken, together with establishment of strategic, financial and management cases, supported by inputs such as interactions between frontages, governance and SEA findings, to identify a preferred Strategic Management Approach (Section 6). Finally, an implementation plan has been developed (Section 7) for delivery of the Strategy outcomes.

1.2.2.2 Structure and content of individual Sections

Section 1 (this current section) provides an overview of the background to the development of the Strategy. Development of the Strategy draws upon a substantial amount of work and detailed studies. **Appendix A** provides an overview of these studies, signposting how information has been used throughout the Strategy, with reference to other sections of the report and subsequent appendices or references to other documents and studies.

Section 2 summarises the broader national and regional policy framework. This is supported by information provided in **Appendix B**. Based on this, and as developed further in Appendix B, Section 2 concludes with the agreed principles underpinning the development of the Strategy and setting out the overall Strategy level objectives for management.

Section 3 provides a more detailed description of the area, including a description of the physical structure of Mounts Bay and a description of the different local areas, highlighting the critical interactions and interdependencies of the larger area. This is linked to the more local initiatives and previous studies (discussed in more detail in **Appendix B**).

(Appendix B was developed at the start of the Strategy providing a baseline understanding of different aspects of the coastal system and the initiatives in the area. It has been developed further during the Strategy development. This recognises the on-going nature of coastal and shoreline management, with a clear emphasis on building upon the existing knowledge base.)

Section 4 provides an initial analysis and discussion of the problems being faced, considering this from the perspective of the two baseline scenarios of:

- no further investment in risk management (Do Nothing) and
- continuation of the existing approach to management.

This takes a slightly different approach from that of just considering the normal "Do Nothing" baseline. With defences so embedded within the way in which the area is currently used, and with existing third-party defences (e.g. harbour structures) having a significant influence of this, the definition of the problem also needs to consider consequences and constraints relating to current management approaches. In this, it is emphasised that the Strategy aims to provide an holistic approach to management, rather than sole consideration of direct flood and erosion risk areas. The aim of the Strategy is to set out an integrated plan for resilience.

As part of developing Section 4, this section brings together the significant level of study that has already been undertaken. However, in addition, it was recognised that there were areas, most particularly in the areas where the SMP identified an overall policy for Hold the Line, where more detailed examination was required.

The initial stage in developing the Strategy has, therefore, been in considering these local areas, in effect, providing a consistent level of understanding over the whole strategy area. This has drawn upon more general information and modelling previously undertaken. These individual local assessments are presented as **Appendices C1, C2, C3** and **C4** to this main document.

Section 4 draws together the findings and conclusions of this previous work, alongside the new information and conclusions made with respect to the areas not previously considered. The section considers the local issues raised, bringing this together as an analysis and definition of the problem and opportunities across the whole area, discussing how local issues relate to the higher level Strategy Objectives set out in **Section 2**.

Section 5 combines the various options identified in the local assessments, developing, from this Local Short List options, a range of Strategic Management Approaches for the whole area.

Section 6 considers each of the Strategic Management Approach options (and sub-options), considering these options in terms of the overall economics, financial, commercial, management factors and incorporating the environmental issues considered by the Strategic Environmental Assessment (SEA).

This iterative and integrated process culminates in the definition of the Preferred Strategic Management Approach reported in **Section 6**. This section is supported by Appendices (Appendix D and E) covering the economics and costs and the strategic carbon footprint assessment, respectively, and through the development of the SEA.

Section 7 sets out the full implications associated with the Preferred Strategic Management Approach (The Strategy), highlighting how this interacts with the broader management drivers for the area, and discussing how The Strategy would be implemented. Implementation is discussed in terms of the overall timeline and the need for more detailed development of the preferred Strategic Management Approach, including as necessary the development of an adaptative pathway approach (recognising the on-going longer term uncertainties). This includes a review of The Strategy in relation to the SMP and how the SMP may need to be updated to reflect the findings of this current study.

2 Strategic Context, Strategy Principles and Objectives

2.1 National and Regional Strategic Context

2.1.1 National

Over the last few decades there has been a substantial shift in attitudes towards FCERM and its interaction with the broader management of the coast, moving from the focus on management of defences, per se, to considering more broadly the concept of managing what is at risk. Within this, the concept of resilience has more recently been introduced, recognising, particularly at the coast, the need to adapt to coastal change, with the increasing rate of change as a result of climate change. Associated with these changes in attitude is the greater focus on considering the coastal and fluvial systems in the context of Place and delivery of a vibrant and sustainable environment, with a shift from merely addressing the short-term issues to having a view to the future. This is reflected in recent national policy and guidance.

Defra FCERM Policy Statement

The Policy Statement sets out the following overall goals:

- **To create a nation more resilient** to future flood and coastal erosion risk. In doing so, **reduce the risk of harm to people, the environment and the economy**.
- We will be better protected to **reduce the likelihood of flooding and coastal erosion**.
- We will be better prepared to **reduce the impacts when flooding does happen**

The Statement elaborates on these goals for five Policy Areas, setting out progress, the Government's vision for the future and actions for relevant topics. Of particular relevance to the Mount's Bay Strategy is the recognised need to:

- Ensure our communities and businesses have the information they need to take ownership of their resilience. We will provide support to communities to increase awareness and understanding of risk, and share advice on steps which can help to better prepare.
- Support every place to thrive in a changing climate by adopting and encouraging a catchment-based approach, transforming the current approach to local flood and coastal erosion risk planning so that every area of England will have a more strategic and comprehensive plan that drives long-term local action and investment. Local flood and coastal erosion plans will link with wider plans for an area such as water resource plans and local nature recovery strategies to seize opportunities to secure multiple benefits.
- In areas facing significant coastal erosion and impacts from sea levels rising, we will provide support to local areas to help them to implement long-term plans to manage risk.
- Increase our resilience to provide benefits for our natural environment, wildlife, ecosystems, and historic environment. Our commitment to embed net gain through development, as set out in the 25 Year Environment Plan, will mean that flood risk management schemes increasingly deliver overall improvements for the environment.
- Ensure that long term investment decisions should follow an adaptive approach which takes account of climate change and demographic change over time. This will enable local decision makers to identify the best combination of resilience actions and the right time to act and invest – helping to reduce unnecessary expenditure and preventing organisations from being locked into investments that may not provide the best long term solution.
- Support coastal communities to unlock barriers to their development and growth, and to strengthen their appeal as places to live, work and visit. As the risk of flooding and coastal erosion increases, we must work together to support coastal communities to increase their resilience.

Environment Agency FCERM Strategy

As set out in the foreword to the Environment Agency's strategy: "This (*FCERM*) Strategy sets out practical measures to be implemented by risk management authorities, partners and communities, which will contribute to longer term delivery objectives and our vision: A nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100".

The Environment Agency Strategy has three core ambitions concerning future risk and investment needs:

1. Climate resilient places: working with partners to bolster resilience to flooding and coastal change across the nation, both now and in the face of climate change
2. Today's growth and infrastructure resilient in tomorrow's climate: Making the right investment and planning decisions to secure sustainable growth and environmental improvements, as well as resilient infrastructure.
3. A nation ready to respond and adapt to flooding and coastal change: Ensuring local people understand their risk to flooding and coastal change, and know their responsibilities and how to take action."

More specifically the Environment Agency FCERM Strategy sets out the need:

- To take an approach that reflects the different circumstances of places – not just their population size, but also their distinctive characteristics, be they coastal, urban or rural. Local people and local partners should be at the heart of making local choices about the best combination of resilience actions for achieving greater flood and coastal resilience in the places in which they live and work.
- For RMAs to consider use of nature-based solutions and improve the environment; new approaches for conservation of protected sites; FCERM investments to contribute to improving environment and achieving water quality objectives; Local Nature Recovery Strategies that enable habitats to contribute to flood and coastal resilience.
- For planning and adapting to future climate risks as being crucial to making sure places remain resilient to future flooding and coastal change over the longer term. This means looking out to 2100 and beyond to ensure we are resilient to future climate hazards. Adaptation planning needs to be integrated across all four of these resilience approaches (strategic objective 1.3).
- We need to manage climate uncertainty to enable investment in suitable resilience actions at the points when they will provide maximum benefit. Looking out to the year 2100, every place needs to identify the decisions for managing flooding and coastal change to be taken now and those which can be made in the future. Environment Agency will work with other risk management authorities and local partners to develop adaptive pathways that enable local places to better plan for future flood and coastal change and adapt to future climate hazards.

Environment Act

The Environment Bill was introduced into parliament on 15 October 2019. It was re-introduced to parliament following a general election on 30 January 2020 and was enacted as the Environment Act[2] in 2021. The Act 2021 sets out how we plan to protect and improve the natural environment in the UK. The plan sets out the government's approach to maintain and enhance the natural environment over the next 25 years and will focus on connecting people to nature, properly valuing the environment, and making global environmental ambitions relevant to local situations. It is part of the UK Government's goal to be the first generation to "leave our environment in a better state than we found it".

The key changes are as follows:

- An Office for Environmental Protection will be created.
- Legally binding targets will be established for air quality, water, biodiversity and waste efficiency.

[2] *https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted*

- Developers will be required to deliver 10% net environmental gain through any new proposals. As part of their consent application, developers will need to submit a Biodiversity Gain Plan to demonstrate the pre-development biodiversity value of the site and any mitigation that will be undertaken. Any proposed mitigation / compensatory measures will need to be in place for at least 30 years.
- Extra duties placed on local authorities to contribute to the Nature Recovery Network ambitions.
- Water resource management plans will become statutory.

2.1.2 Regional

Both Cornwall's Environmental Growth Strategy and the Strategic Economic Plan (below) highlight the need for an integrated approach to be taken within the overall area, recognising the critical interdependencies between the natural environment, social wellbeing, heritage and culture and economic regeneration.

Cornwall Environmental Growth Strategy

Cornwall's Environmental Growth Strategy (2015 – 2065) aims to underpin and inform decision making within and beyond Cornwall Council for the next 50 years. "Environmental growth will change our thinking and practice; it will ensure that nature can sustain and support our communities and businesses in the future. This Strategy has been developed to inform and improve strategic investment and decision making in Cornwall and offers a framework for stakeholders and partners to work more effectively together". The core ambitions and target outcomes of this strategy are set out under the key headings of:

- Experiencing Cornwall – That people are connected with Cornwall's nature and culture such that Cornwall is a happy, healthy place to be.
- Understanding Cornwall – That the specific characteristics of Cornwall's environment are well understood and are highly valued and appreciated by all. With this being supported by an environmental management system that supports environmental growth.
- Valuing Cornwall – That Cornwall's working structure and practice support continued environmental growth, encouraging an excellent environmental skills base.
- Achieving Environmental Growth – That Cornwall's environment provides the stability for economic and social prosperity. That Nature in Cornwall is abundant, diverse and well connected and that Cornwall is well-managed, resilient and supported by a healthy, naturally functioning environment.

Cornwall and Isles of Scilly Strategic Economic Plan

In 2017, Cornwall Council adopted the Cornwall and Isles of Scilly Strategic Economic Plan (2017 -2030). This was developed in order to support the delivery of the Environmental Growth Strategy and identifies the following strategic goals (or objectives) for the region:

- In 2065, Cornwall's environment will be naturally diverse, beautiful and healthy, supporting a thriving society, prosperous economy and abundance of wildlife.
- People in Cornwall will live longer, happier, healthier lives and good health and wellbeing will be everyone's responsibility.
- A leading rural region for creativity and culture.

This is further developed by the South West Marine Spatial Plan and the Cornwall Maritime Strategy.

South West Marine Spatial Plan

The vision for the South West Marine Plan states that "The South West plan areas are distinctive for the prevalence of fishing, tourism and recreation activities in a traditional and quintessential maritime setting. To the west and south of the plan areas, commercial fishing, tourism, defence, port development and

harbour regeneration supports a strong maritime economy which encourages economic growth. To the west, growth of renewable energy opportunities has been realised throughout the South West marine plan areas. The diversity of habitats and species are protected and enhanced and managed as one ecosystem across boundaries and borders. The AONBs and National Parks continue to protect local wildlife and cultural heritage as well as enhancing the outstanding beauty of the South West. A network of Marine Protected Areas has recovered and continue to be valued and protected."

Cornwall Maritime Strategy

The Maritime Strategy provides a unifying and long-lasting policy framework for the planning of the land, sea and coast around Cornwall. The Strategy's vision is that by 2030:

- Cornwall has a sustainably managed maritime environment, which is well understood and known internationally as an excellent location for work, wildlife and for recreation.
- Cornwall's economy is supported by a diverse range of opportunities for ports, marine-related industries, transport and businesses including environmental technologies.
- Cornwall has a rich and enviable maritime heritage, a healthy maritime natural environment and landscape.
- Cornwall has distinctive, well-connected communities, resilient in the face of change.

In order to achieve this vision the Strategy has identified a number of cross-cutting and overarching themes that are supported by a high level objective and discussed further in Appendix B.

Appendix B also considers more local plans including the Penzance and Newlyn Area Framework Plan, Penzance Neighbourhood Plan, Marazion and District Community Plan, Ludgvan Neighbourhood Plan, all of which provide further detail in developing the Strategy.

2.2 Cornwall and Isles of Scilly Shoreline Management Plan

The Shoreline Management Plan (SMP2), adopted in 2011, identified the complex nature of the north western area of Mount's Bay (from Marazion through to Mousehole), including the need to support and sustain the important settlements of Penzance, Marazion, Newlyn and Mousehole. The SMP set out policy across 16 policy units, grouped within 4 management areas (Table 2.1).

Table 2-1. SMP Policy 2011

Policy Unit		SMP2 Policy Plan		
		2025	2055	2105
19.1	Undefended Cliffs (including southern part of Mount)	NAI	NAI	NAI
19.2	Marazion east (Venton Cove)	**NAI**	**NAI**	**NAI**
19.3	Marazion Town	HTL	HTL	HTL
19.4 (a)	St Michael's Mount - Causeway	HTL	**NAI**	**NAI**
19.4 (b)	St Michael's Mount – Harbour	HTL	HTL	HTL
19.5	Marazion west (Chapel Rock to Marazion Bridge)	HTL	HTL	HTL
19.6	Marazion Marsh	HTL	HTL	HTL
20.1	Longrock	HTL	**MR**	**MR**
20.2	Eastern Green	HTL	**MR**	**MR**
20.3	Chyandour	HTL	HTL	HTL
21.1	Penzance Harbour & Docks	HTL	HTL	HTL
21.2	Wherry Town	HTL	MR	MR
21.3	Newlyn	HTL	HTL	HTL
21.4	Sandy Cove	**NAI**	**NAI**	**NAI**
22.1	Cliff Road	HTL	HTL	HTL
22.2	Mousehole	HTL	HTL	HTL

While the SMP2 divided the area into specific policy units, recognising the different nature of FCERM issues, there was the recognition that each area contributed to the broader overall wellbeing, economic

and environmental vision for the Mount's Bay frontage. The SMP provides the essential, initial policy level assessment for management, highlighting critical issues that needed to be addressed. These issues are taken forward into the more detailed analysis provided within The Strategy. On completion of The Strategy, the findings of the Strategy are fed back and reconciled with the broader intent of the SMP as part of the on-going refresh of the SMP. This reconciliation is covered in **Section 7** of this report. This is in line with the recommendations made within the SMP Refresh Project (Environment Agency 2020).

2.3 Core Principles

Based on all the above, the following principles have been agreed, underpinning the development of the Strategy. (This is discussed further in Appendix B.)

- That the development of the study is inclusive and informative:
  - Creating a common understanding of flood and coastal erosion risk in Mount's Bay.
  - Developing wider understanding of the aspirations for the area and how this links to flood and coastal erosion risk management and land-use planning.
  - Ensuring stakeholders feel part of the Strategy development.
  - Working with communities, landowners and other partners to promote the resilience of the natural system as the most effective way to address long-term flood and erosion risk associated with climate change.
- That the study is underpinned by the principle of environmental net gain, growth and investment in natural capital:
  - Full consideration given to the natural capital of the bay and surrounding area.
  - In examining different options, preference should be given to opportunities to deliver enhancement and diversity of the natural environment.
  - Supporting the creation of open space and landscapes that are designed to create a healthier and happy place.
- To develop confidence in the future for economic and social prosperity:
  - To maintain and support the social and economic viability and core values of the coastal settlements within the Mount's Bay area. This is to be achieved by preventing or minimising economic losses through reducing coastal erosion and coastal flooding to residential, commercial and industrial property while supporting adaptation and resilience where protection is not possible or where this allows more sustainable forms of defence.
  - Promote adaptation and resilience of critical infrastructure and diversity of transport links (road, rail, sea, air) to support regeneration and a vibrant local economy.
  - To reduce the future burden of carbon emissions through supporting sustainable transport infrastructure.
  - Avoid, reduce or offset the potential carbon emissions during construction, operation, and maintenance activities in line with the stated no carbon aims of Cornwall Council and the Environment Agency.
- Promote the importance of communities and sense of place:
  - Support economic regeneration throughout Mount's Bay, including marine-based and agricultural industries, diversification of tourism and associated job creation, together with

sustainable development and regeneration of the harbours based on needs of the wider community.

- To protect and enhance the high-quality landscape, seascape, and visual amenity, alongside enhancing the opportunity for increasing awareness and enjoyment of Mount's Bay's cultural and heritage features.
- Promote an integrated strategy whereby due consideration of all the above principles is embedded in the development of the Strategy and specific objectives are developed and used in distinguishing between options.

2.4 Mount's Bay Coastal Strategy Objectives

Building upon the objectives from the SMP2 and the Adaptive Frontages Strategy, the following objectives are proposed for the Mount's Bay Coastal Strategy:

To maintain and support the social and economic viability and core values of the coastal settlements within Mount's Bay by preventing or minimising economic losses through reducing coastal erosion and coastal flooding to residential, commercial and industrial property to a level of no residual risk or supporting adaptation and resilience where protection is not possible or where this allows more sustainable forms of defence.

To prevent or minimise social and economic degradation by reducing the impact of coastal erosion and coastal flooding through defence to, or adaption of transport and other infrastructure. Thus, maintaining or enhancing national and regional connectivity (A30 trunk road and mainline railway line) in a sustainable manner.

To prevent or minimise impact of coastal erosion and coastal flooding to community and visitor assets (including beaches) and maximise the potential to increase and support diversification of tourism, recreational and other economic opportunities along the coastline.

To prevent or minimise deterioration to health impacts resulting from coastal erosion and coastal flooding.

To support the achievement of "good ecological status" for the freshwater and marine environment under the EU Water Framework Directive.

To work with natural processes wherever possible in order to minimise the extent and scale of coastal flood and erosion management measures.

To prevent or minimise coastal management interventions that have an adverse impact on the geomorphological processes and geological interest, while supporting interventions that work with these processes, particularly with respect to the supply, distribution or retention of coastal sediment.

To conserve protect and enhance designated and non-designated heritage assets and their settings, including: heritage assets such as Scheduled Monuments, Historic Parks and Gardens, Listed Buildings, and Conservation Areas.

To protect and enhance the high-quality landscape, seascape, and visual amenity (e.g. AONB and St Michael's Mount seascape).

To protect and enhance the biodiversity within Mount's Bay and, where possible, support existing habitats and species to adapt or respond to climate change.

2.5 Application and Assessment of These Objectives

2.5.1 Overall Approach

The above objectives and principles drove the thinking and selection of management approaches throughout development of the Strategy. However, it is recognised that different possible approaches to management for different sections of the coast will inevitably lead to conflict, and not all objectives can be fully met. For example:

- a totally naturally functioning shoreline could only be achieved through major change (and loss) to much of the present use of the coastal area,
- maintaining the existing approach to defence, as at present, inevitably constrains the natural development of the shoreline;

and indeed at a more specific level,

- managing one aspect of the coast, such as maintaining protection to individual features of the coast, may impact on the amenity value supporting use of that feature, or
- maintaining protection of important freshwater features, such as Marazion Marsh, raises the risk of limiting the natural development of the shoreline environment.

The objectives have, therefore, to be considered in the round, considering, obviously in the context of statutory requirements, how a sensible balance can be achieved, delivering and encompassing the aims of Cornwall's Environmental Growth Policy.

This balance is captured in the "Principle of environmental growth" diagram (Figure 2.1), taken from the policy document, with the strong emphasis on improving and restoring the function of the natural environment, rather than merely sustaining what is there.

Figure 2-1. Principle of environmental growth.

This all recognises that the Strategy has had to have been developed from "where we are now" (discussed in Section 3). Much of the coast and its use has developed alongside a history of increasing constraint on the natural behaviour of the coast; as a result of the past approach to flood and coastal erosion risk management and the development of the two important harbour areas. However, while this "where we are now" will shape how we are able to move forward, the Strategy needs to examine opportunities for change to a more sustainable integrated management approach in the future. This approach aims to move on from and address the major challenges associated with how the area is currently perceived and managed (as discussed in Section 4).

A sustainable Strategy fundamentally involves change and, associated with this change, involves both collaborative working and a potential need for compromise. With so many involved parties influencing or being affected by decisions being made, this is not a simple process and goes beyond the direct decisions being made from an FCERM perspective. The Strategy aims to use the broad range of objectives to support planning and delivery of locally owned plans and a place-based approach to better connect decision-makers; facilitate collaborative restoration planning and delivery; and strengthen policies and

provide a direct link from national governance to local communities, acknowledging what is valuable from multiple perspectives.

This attitude drives the development of the list of Strategic Management Approaches (Strategic Options), set out in Section 5. Considering options necessarily includes the Do Nothing scenario, alongside considering the impacts and outcomes of continuing to manage risk as we are now (i.e. sustaining existing protection). This, in particular, considers where this present management approach would drive management into the future.

Alongside this, alternative management approaches are considered, where the Strategy offers greater opportunity for adaptation and resilience and, where there is the need to continue to defend, examination of opportunities for modifying current approaches to allow better integration within the broader objectives.

2.5.2 The Assessment Process

The primary and detailed assessment of the Strategic Management Approaches is undertaken through the SEA process, with this process feeding back into the consideration and development of the Options. This is alongside highlighting where further matters need to be addressed or where there may be the need for detailed mitigation as the preferred Strategy is taken forward.

The SEA builds from the initial preliminary assessment of the long list of local Options for each area making up the wider frontage (Appendices C1, C2, C3 and C4, together with previous studies identified in Appendix A), drawing this together in the overall assessment for the whole Mount's Bay Strategy area.

In undertaking the strategic assessment, the SEA draws upon the Strategy Objectives, drilling down more specifically through definition of detailed indicators associated with each objective. Alongside this, recognising that there are both positive and negative impacts associated with some indicators, the SEA provides a more holistic assessment across the wider area. Critically, this highlights uncertainties and interdependencies which will need to be addressed in taking forward the Strategy in the future.

The findings of the SEA are brought out through the discussion of the Strategic Management Approaches (Section 6) where, in addition to the basic headings of Economic, Commercial, Financial and Management, there is a discussion of the Constraints and Opportunities with a sub-section highlighting opportunities in relation to the natural environment.

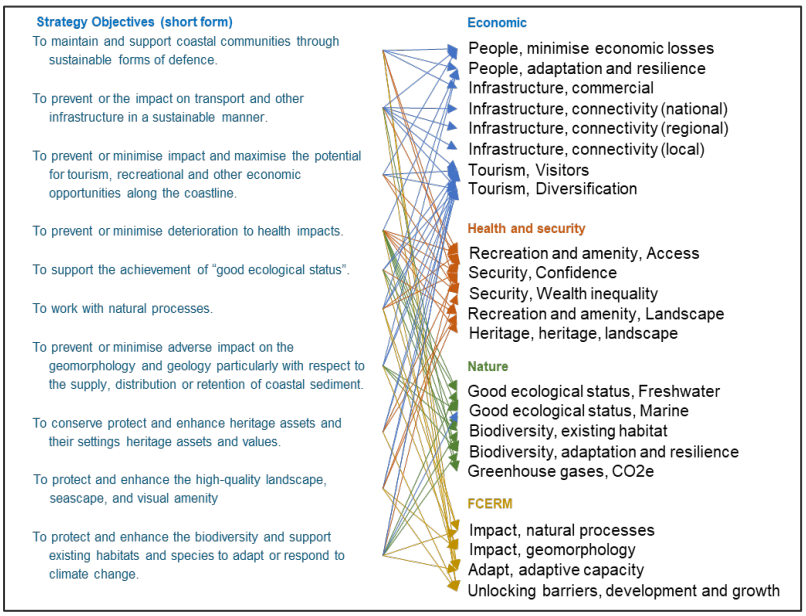


Figure 2-2. High level assessment outcomes in relation to objectives.

Within Section 6 a high level assessment is made in terms of the overall outcomes matched against the three integrated criteria discussed in Cornwall's Environmental Growth Policy (i.e. Economic, Health and Security and Nature), alongside additional criteria identified within the National FCERM Strategy. Figure 2.2 demonstrates how the Strategy Objectives map across to these high level outcomes.

While based fully on the assessment provided by the SEA, this allows a more holistic, high level comparison between Strategic Management Approaches, showing the general balance in delivery of outcomes between different values and aspects of the coast.

2.5.3 Taking the Strategy Forward

The objectives and assessment of objectives within the SEA is important in developing management and implementing the Strategy (Section 7).

As noted above, this will require a collaborative approach, involving different parties with differing perspective and values. The Strategy aims to present a balanced, sustainable approach to management, underpinned by the opportunity to make improvements to the natural environment, either specifically or through opportunities identified within the approach being recommended.

This accepts and, in fact is driven by, the need for change, particularly where there is opportunity to deliver Cornwall's principles for environmental growth. However, within this will be the need to address areas where some form of mitigation will be required, as identified by the SEA, as specific aspects of the Strategy are taken forward.

Alongside this, and as part of the collaborative working, there will be the need for joint funding where mutual benefits are identified by the Strategy.

The Strategy aims to deliver a long term plan for management, setting out, at least in principle, the implications and potential positive and negative impacts. For some aspects of the Strategy there is the need for critical decisions to be made now.

In other areas, there is a longer term lead-in period where issues and approaches to management will need to be developed further with communities and other stakeholders. While the Strategy aims to provide a strong framework, framing the problem both at a local scale and within a broader context, and sets out a realistic way forward, it is recognised that, in detail, modifications of the strategic approach may emerge.

Notwithstanding this, The Strategy and SEA are seen as a baseline upon which detailed implementation should and can be built.

3 Description of the Strategy Area

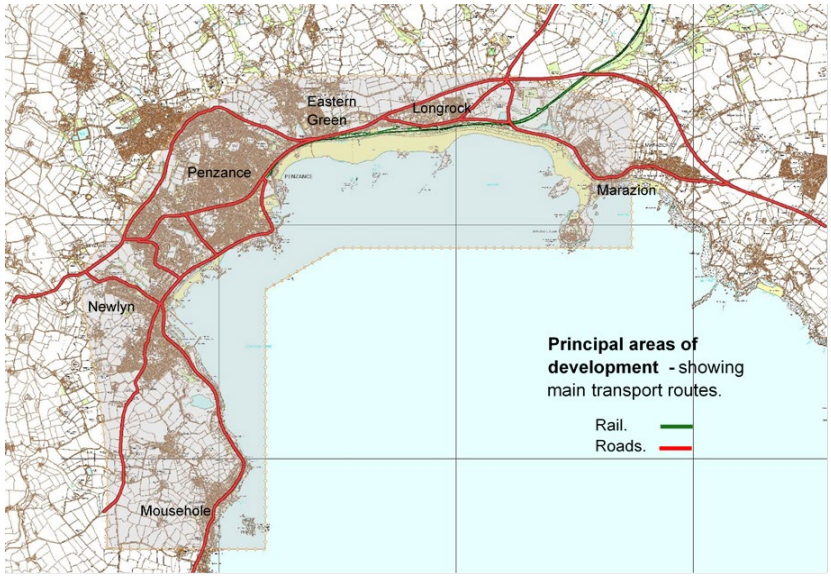
In line with the core principles underpinning the development of the Strategy, this section aims to provide a greater understanding of the area and the interactions between the pressures for coastal change and the broader aspirations for the area. This re-emphasises the underlying findings of the SMP, recognising both that there are areas of the frontage where there is likely to be the need for continued defence or management but also that, in particular with climate change and sea level rise, there are areas where the way in which management is taken forward will require different approaches. This current section of the Strategy document (**Section 3** provides brief general description, followed by a more description of the underlying physical structure and behaviour of the coast. This aims to provide the context for management and allowing consideration of core features of the area.

Sub-section 3.3 discusses the overall area, highlighting the interactions such as the transport system, the interconnection and interdependency between core areas of population, alongside describing the broader aspects of the natural environment and landscape. As part of this discussion, consideration is given to how these broader scale features of the coastal area impose constraints on the natural development of the coastline or would be influenced by this natural change. Consideration at the broader level is also given to identify opportunities for change, feeding in to the development of The Strategy. Within the context of this broader level description, a description is then provided, at a more local level, of key aspects relating to individual frontages (further detail on this is provided in Appendix C).

This Section provides the baseline from which to assess the on-going risk and need for change (**Section 4**) and the development of (**Section 5**) and appraisal of options for management (**Section 6**).

3.1 General Description

The Strategy area (Figure 3.1) includes the four major settlements of Marazion, Penzance, Newlyn and Mousehole, with much of the lengths between Marazion and Penzance and Penzance and Newlyn being developed. To the eastern side of Marazion is the community of Trevenner, set some way back from the soft cliffed shoreline of Goldsithney Bay. Along the road between Newlyn and Mousehole are the small communities of Skilly and Roskilly.



While each of the major settlements has significantly different characteristics, these centres each contribute to overall effective use and function of the wider area. This overall connectivity is discussed in terms of the natural and built environments later **Section 3.3**, building from the local level descriptions in **Section 3.4**.

Figure 3-1. Strategy area with principal development areas and main transport routes

3.2 Physical Description

(Figure 3.2 shows the general topography and bathymetry for the area, with reference to principal locations within The Strategy area.)

3.2.1 Water Levels

As part of the overall study, water levels have been reviewed and updated based on latest astronomical tidal levels taken from the National Tide and Sea Level Facility (NTSLF) based on the Standard Port of Newlyn. Extreme water levels are based on the recently updated report, Coastal Flood Boundary (CFB) conditions – update 2018 (base year 2017), with reference to the closest point to Newlyn (Lat/Lon: 50° 06' 32.9736" N, 5° 30' 12.5273" W). These values are set out in Table 3-1.

With climate change, water levels are predicted to continue to rise into the future. Two emissions scenarios, called Representative Concentration Pathways (RCP), have been considered based on information taken from the latest SLR projections based on UKCP18.

Table 3-1 shows the results for RCP 8.5 (95%tile) and RCP 4.5 (95%tile), illustrating the change in water levels (tidal and extremes) over different time periods, through to 2120 (100 years from present day).

The Strategy has been primarily developed on the basis of the RCP 8.5 (95%tile), recognising that there is uncertainty over when values included in Table 3-1 might actually occur. This is reflected by inclusion of the RCP 4.5 (95%tile).

Table 3-1. Updated water levels m OD (based on Newlyn)

Newlyn	Tide levels					Extremes						
2017	MLWS	MLWN	MHWN	MHWS	HAT	T1	T5	T10	T20	T50	T100	T200
	-2.25	-1.04	1.29	2.49	3.08	3.1	3.3	3.3	3.4	3.5	3.5	3.6
RCP8.5 95%												
2030	-2.15	-0.94	1.39	2.59	3.2	3.2	3.4	3.4	3.5	3.6	3.6	3.7
2050	-1.95	-0.74	1.59	2.79	3.4	3.4	3.6	3.6	3.7	3.8	3.8	3.9
2070	-1.69	-0.48	1.85	3.05	3.6	3.7	3.8	3.9	4.0	4.0	4.1	4.1
2120	-0.82	0.39	2.72	3.92	4.5	4.5	4.7	4.8	4.8	4.9	5.0	5.0
RCP4.5 95%												
2030	-2.16	-0.95	1.38	2.58	3.2	3.2	3.3	3.4	3.5	3.6	3.6	3.7
2050	-2.00	-0.79	1.54	2.74	3.3	3.4	3.5	3.6	3.6	3.7	3.8	3.8
2070	-1.81	-0.60	1.73	2.93	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.0
2120	-1.28	-0.07	2.26	3.46	4.0	4.1	4.2	4.3	4.4	4.4	4.5	4.5

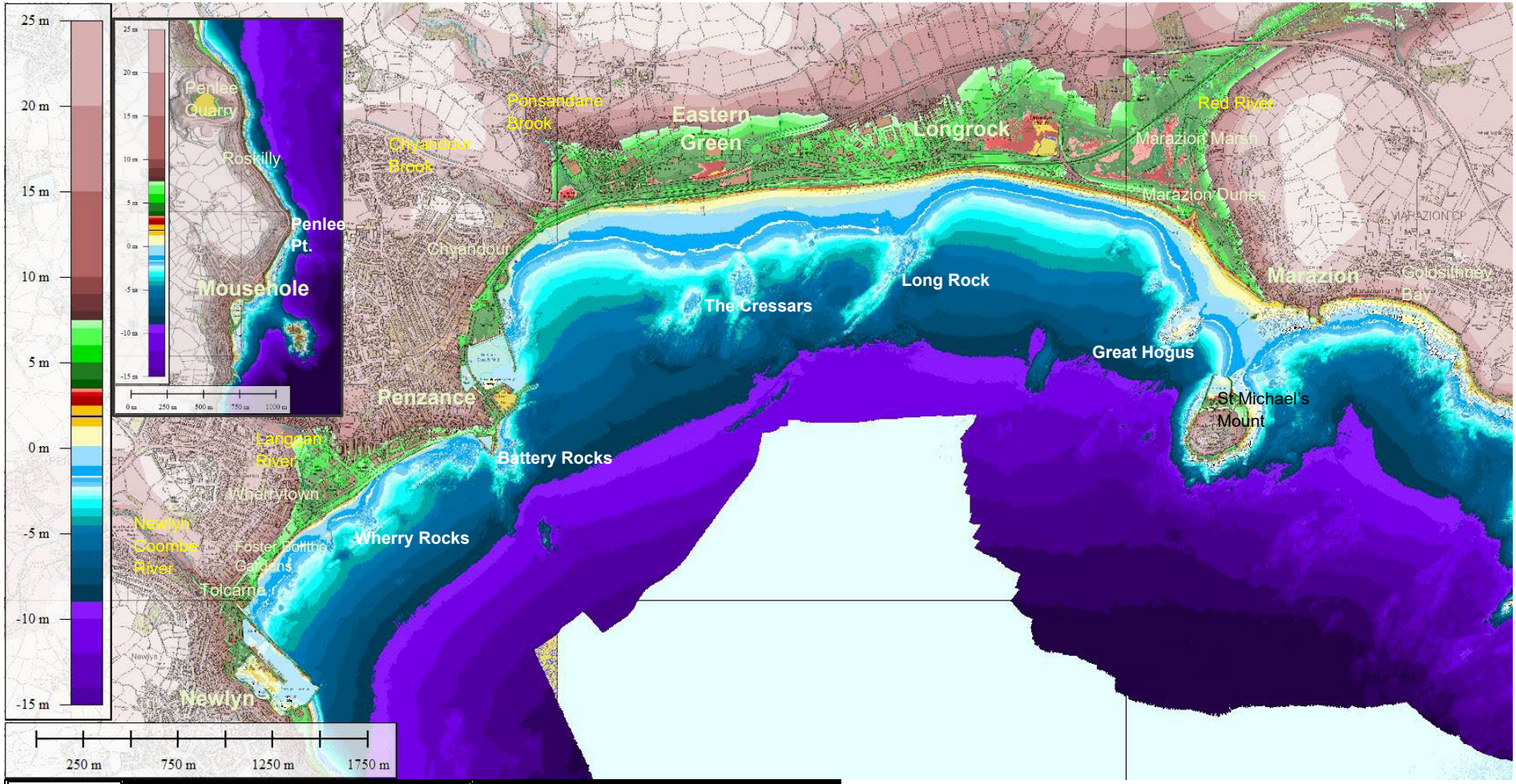
It may be seen from the general representation of land levels shown in Figure 3-2 that while core areas of Marazion, Penzance and Newlyn have developed on higher ground, there are substantial areas of development in the lower lying land between the main towns' centres. This is discussed below in realtion to future sea level rise.

Figure 3-3 shows a comparison of land levels in relation to coastal water levels for the Strategy area, showing how this changes with projections of sea level rise. This provides an initial indication of the areas at risk from tidal flooding should defences fail.

Figure 3-3 (Present Day) shows the lower lying areas between Marazion and Penzance, in particular the low lying land occupied by the Marazion Marsh, associated with the valley of the Red River, alongside the lower lying area associated with the Lariggan River at Wherrytown and the relatively low lying nature of areas associated with the development (in the mid-1800s) of the two main Harbours.

With sea level rise over the next 100 years (based on the RCP 8.5 (95%tile) projection scenario), land levels relative to the water levels obviously reduce such that:

- At Marazion much of the Marazion Marsh and areas of the western part of the Town land levels are, by 2120, within the intertidal water level zone (i.e. lie between MHWN and MWHS levels);
- At Eastern Green and at Wherrytown there are areas where land levels lie, by 2120, within a zone where if undefended they would be subject to increased flooding under more extreme tidal conditions (i.e. between MHWS and the T10 level) and;
- Areas associated with the Harbours would (by 2120) be at substantially greater flood risk.



Newlyn	Tide levels					Extremes						
2017	MLWS	MLWN	MHWN	MHWS	HAT	T1	T5	T10	T20	T50	T100	T200
	-2.25	-1.04	1.29	2.49	3.08	3.1	3.3	3.3	3.4	3.5	3.5	3.6

Figure 3-2. Topography and bathymetry of the Strategy Area.

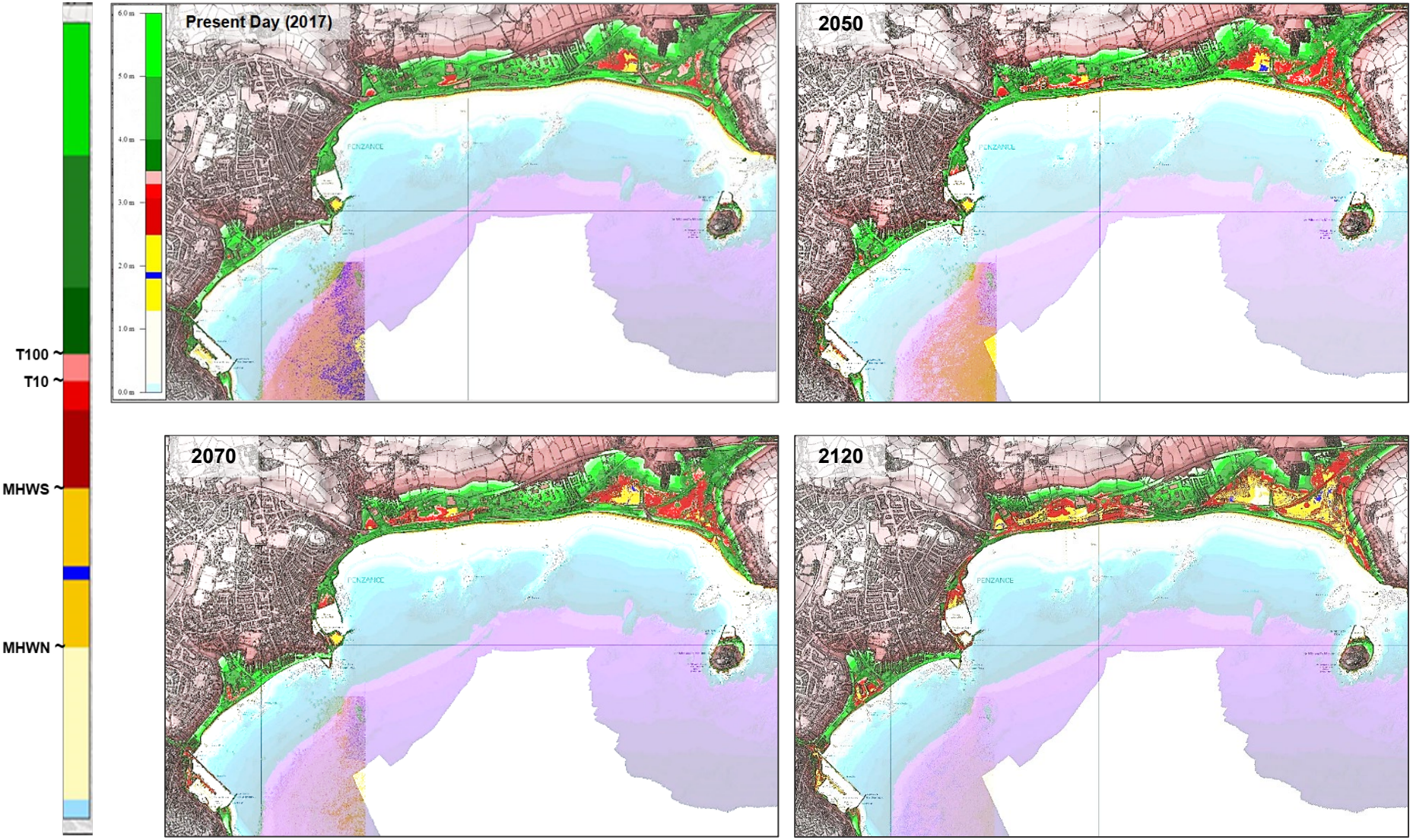


Figure 3-3. Comparison of land levels in relation to tidal water levels over time (the projection of future water levels is based on RCP8.5 (95%ile)).

3.2.2 Geomorphology and Wave Action Shaping the Coast

3.2.2.1 Geological Constraints

Figure 3-2 is also useful in bringing out the influence of the underlying geology on the area. The higher ground associated with the main town area of Marazion, running through to St Michael's Mount, effectively anchors the coastal system at its eastern end. The Penzance headland and the Battery Rocks, effectively fix the shoreline over the centre of the area. The higher, harder structure of the coast running south from Newlyn bounds the strategy area to the west.

As shown in Figure 3-2, Mousehole has been developed on the rising land within a small embayment formed within the harder structure of the coastline, influenced to a degree by the valleys associated with the Tumble Tyn stream and the stream valley running down from Paul. Clearly the Harbour Structures of Mousehole further influence the exposure and the development of the village.

Within this broadscale geological structure, there are more local influences affecting the geomorphology of the area and the way in which the predominant wave forces have then been able to shape the shoreline.

Figure 3-3 shows the slightly higher ground in the area of Longrock running through, logically, to the rock outcrops of Long Rock and the Cressars (Figure 3-2). This is reflected in the slight protuberance of the shoreline in the area of Longrock.

At Marazion, the significant rock outcrops of the Great and Little Hoguses work, in conjunction with the more major feature of St Michael's Mount, to influence the natural development of the shoreline along the western part of the town and allowing the development of Marazion Dunes.

Along the Promenade frontage, while less obviously aligned with the hinterland topography, the Wherrytown and Lariggan Rocks, and to a lesser extent the Queen's Rock at Tolcarne, have all influenced the natural alignment of the back shore, along which defences have been constructed.

3.2.2.2 Waves

The dominant offshore wave direction occurs from the southwest, with high energy swell waves driving in from the English Channel and the Atlantic (Figure 3-4), shaping the general orientation of the softer shoreline further to the east of the larger Mount's Bay area.

Figure 3-4. Dominant SW wave direction

The Strategy area gains significant shelter from the Penwith Peninsular from this dominant wave direction, with waves being diffracted in a more northerly direction as they approach the shoreline. This is shown in the plot of wave modelling in Figure 3-5 (a), with significantly lower wave height exposure from the southwest over the western part of the Strategy frontage.

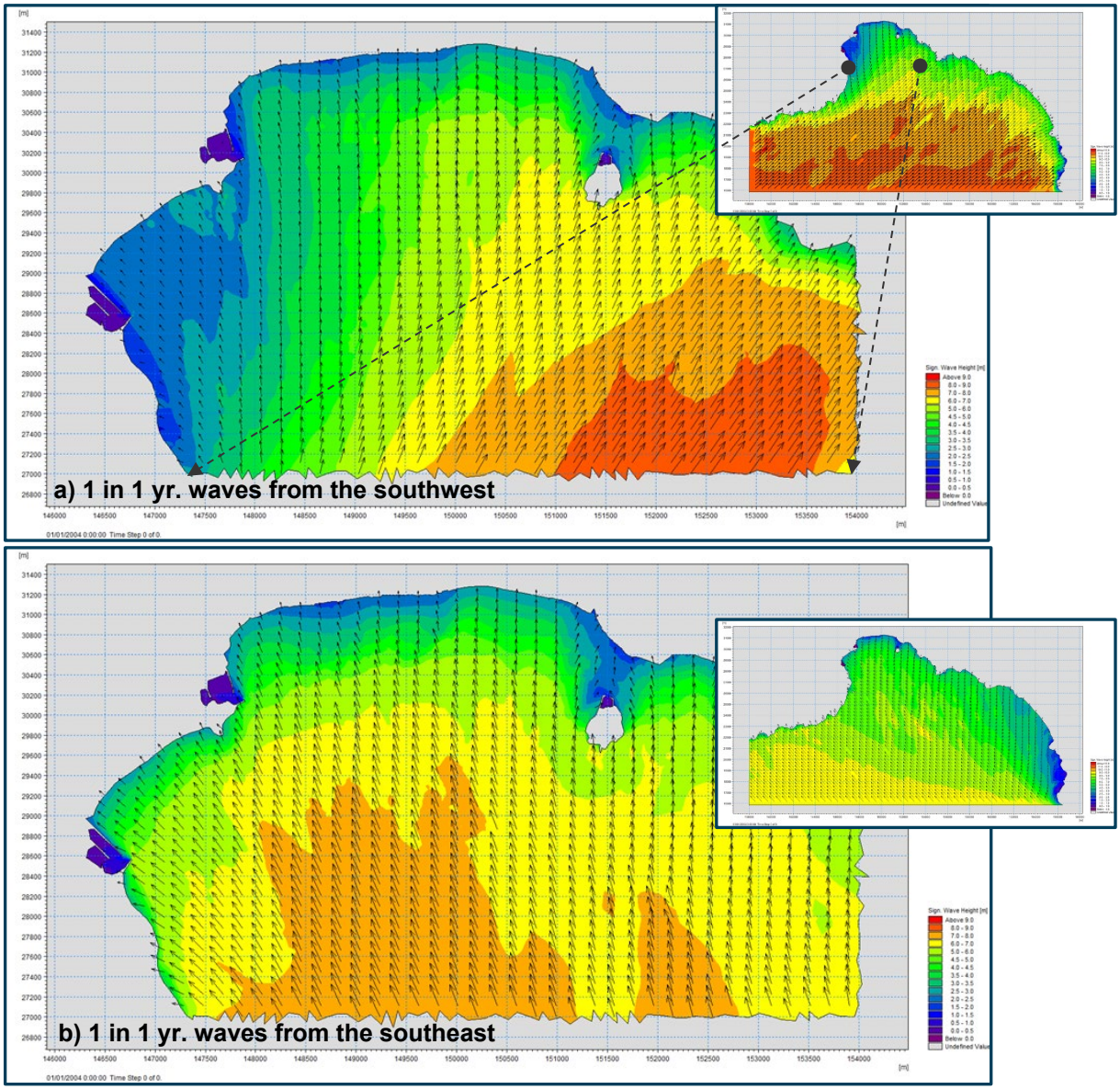


Figure 3-5. General wave exposure- a) SW, b) SE

The frontage is, however, also exposed to less frequent but significant storms from the southeast (Figure 3-5 (b)) , with more consistently high wave energy across the whole area. The highest waves approaching Penzance Harbour frontage derive from a south south-easterly offshore direction, with waves typically in the order of 5m in the immediate offshore area.

Closer inshore, waves are further modified by the nearshore bathymetry and, more locally, by the features of the nearshore described earlier. Under both wave conditions shown in Figure 3-5, waves tend to approach the shoreline between Marazion and Penzance relatively normal to the orientation of the shore. Modelling has shown that there is slight net easterly longshore drift across the main part of this frontage, driven by the more frequent SW offshore wave conditions. However this varies both under different wave directions and, in detail, by position along the frontage, with a slight net westerly drift over the eastern end of the Eastern Green area.

Under both wave conditions shown in Figure 3-5, there is significant modification of inshore wave direction tending to veer towards a more north-easterly direction in the lee of St Michael's Mount. This is reflected in the orientation of the soft shoreline to the western end of Marazion.

Along the Penzance Promenade frontage waves again approach the shoreline in a direction relatively normal to general alignment of the Promenade, although the specific curve of the defences tends create areas of wave focus and excessive overtopping. There is little evidence of significant overall net longshore drift, although there is significant differential movement of sediment along the base of the wall.

Overall, the shoreline is quite well aligned to the wave climate, with wave energy being the main force acting in the development of the softer frontages. Notwithstanding the locally important net longshore sediment movement, the broader scale wave action tends to put onshore pressure on the shoreline. This is discussed below.

3.2.3 Geomorphological progression

The main frontages of the Strategy area have developed over time in line with the main shoreward energy of the waves.

Along the Easter Green / Longrock frontage, it is understood that the railway line was constructed to the back of the beach across the area, with the line running over a timber trestle to the lower lying beach area around Ponsandane. This trestle was destroyed in a storm in 1879, with the railway rebuilt behind a major masonry wall. On the earliest available historical map (1875 – 1906) shown in Figure 3-6 the railway had already been constructed, effectively fixing the shoreline in its current position.

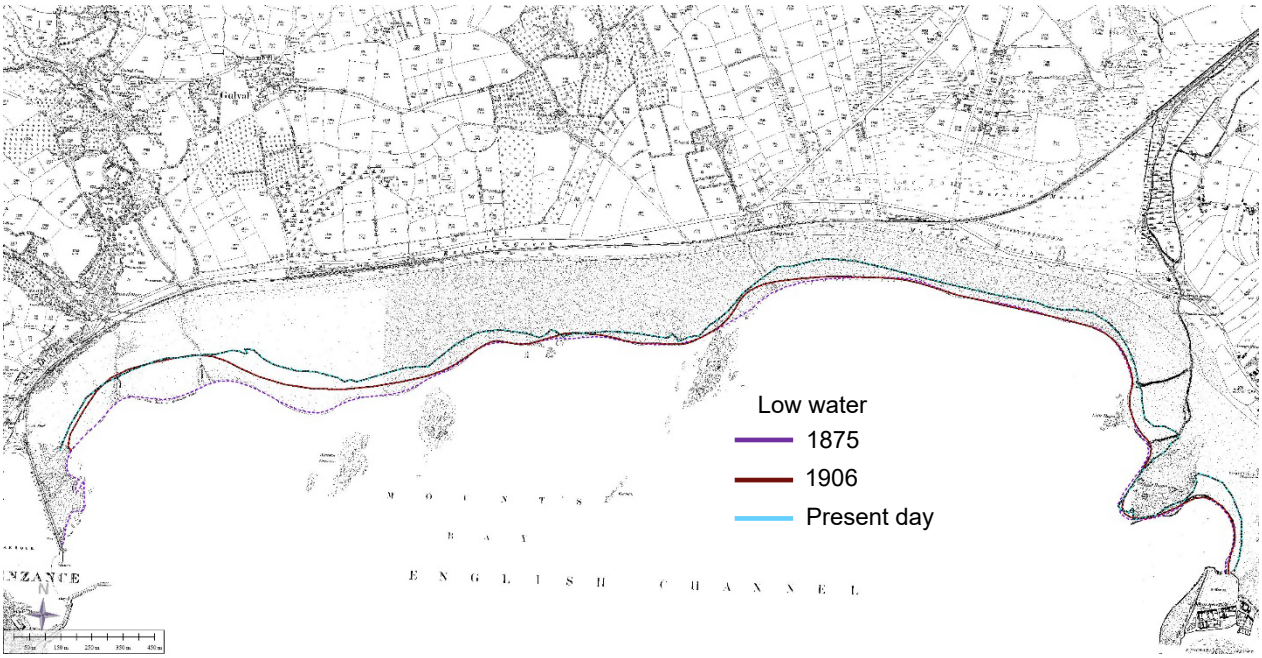


Figure 3-6. 1875 - 1901 historic map of Penzance Harbour to Marazion, showing low water for 1975, 1906 and present day

While this obscures the natural form of the coast, certain points may be made:

- The map indicates that the natural back crest of the beach was at a level of around 4.2m (14 feet) OD, rising to around 5.2m OD towards the Longrock end. Generally the land immediately behind the beach crest dropped in level slightly, rising again further inland.

- There is little evidence of any substantial backshore beach ridge, with the only record of dunes being in the area of the current Marazion Dune length.
- While the map does indicate local areas where there might have been a slightly steeper face to the backshore (potentially indicting local erosion), generally it would be anticipated that there would be a full beach up to a level of around 4m OD.

Progressively, this frontage has been defended with the main masonry walls extending to the east from Penzance Harbour, with the construction of the main embankment seaward of the railway line (which has required additional hard defence) and the construction of the low masonry walls in the Longrock area.

A comparison of the low water contours over time is shown in Figure 3-6. Notwithstanding the caution necessary in interpreting the precise levels associated with earlier mapping of tide lines, there is a strong indication that there has been significant variation compared to present day.

In the area just to the east of the Harbour, the low water mark is shown to have moved landward. This might be associated with wave interaction with the Harbour structures ,with this change happening over the period of time between 1875 and 1906. Further to the east there is a good indication that there has been a progressive landward movement of low water through to present day.

It is more difficult to assess change over the upper area of the beach due to the imposition of a fixed defence line, in some areas moving the defended shoreline seaward. However, there is good indication that beach levels have, over some areas, reduced against to toe of defences. The overall assessment, as highlighted in the SMP, is, however, that the whole beach zone is attempting to set back to accommodate the on-going wave energy, accentuated by sea level rise.

A similar long term pressure is seen in relation to the Penzance Promenade / Wherrytown frontage (Figure 3-7). In this figure, the base map shows the area prior to the construction of Newlyn Harbour. The high water contour is shown up to the property making up Newlyn. Tolcarne had been protected by 1875, with defences in place along the Promenade frontage. Between Tolcarne and Wherrytown there is the indication of some form of defence in the area of the present day Foster Bolitho Gardens but this defence appears to have been abandoned by 1906, with the present set back defence wall being constructed during the early 1900s.

In terms of the lower foreshore, there appears to have been a landward movement of the low water mark most especially in the area of Tolcarne through to Wherrytown and the Lariggan Rocks, potentially associated with the development of the Harbour.

Over the main Promenade frontage there has been a progressive loss of intertidal area with the present day low water mark now being hard against the central section of the main Promenade wall. While the Chimney and Wherrytown Rocks still tend to shape the beach across the whole area, it is notable that they have only been partially effective in holding forward the present day low water mark.

Overall, and notwithstanding some longshore movement of sediment, the main geomorphological change across both softer sections of the Strategy frontage has been for a gradual landward movement of the active beach face. This is consistent with the understanding of wave behaviour applying pressure principally in an onshore direction.

With the upper beach crest fixed in position, this has potentially resulted in some steepening to the foreshore and reducing beach levels against defences.

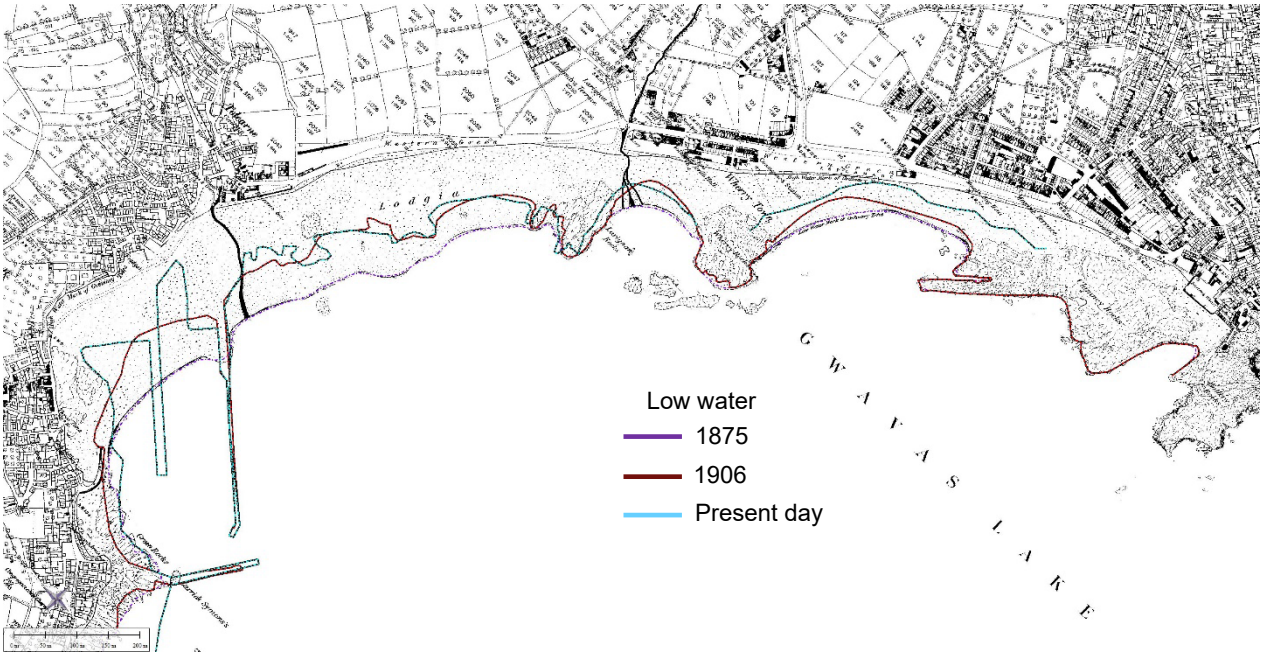


Figure 3-7. 1875 - 1901 historic OS map of Newlyn to Penzance, showing low water for 1975, 1906 and present day

The implications of this long-term trend, highlighted in the SMP, is developed further in examining management of the Strategy area in subsequent sections of the report.

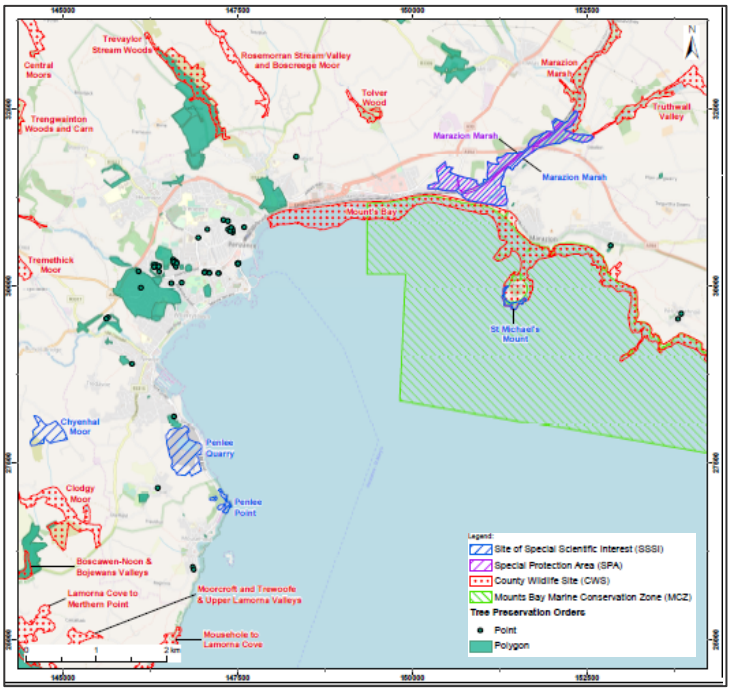
3.3 Description of Broadscale Interactions and Opportunities

3.3.1 Natural Environment and Landscape.

Underpinning the Strategy is the importance of natural environment, with biodiversity being an essential stimulus for both the economy and inhabitants as well as being a key indicator of the overall health of the environment. Critical to the development of the Strategy is considering how this broader perspective of the environment might be influenced by existing constraints and looking for opportunity to maintain, restore or build upon the natural capital – the natural resource and the ecological services provided. Alongside this, and integral to this in terms of environmental growth, is the important natural and historic landscape.

Further details of all these aspects are considered within the SEA but are discussed in outline below, providing a broadscale review of the interaction with the development of the Strategy.

As a whole, the natural areas of the frontage support a diversity of common and rare habitats and species, bounded by a range of coastal and estuarine habitats.



This, in part, is reflected in the Nature Conservation Designations shown in Figure 3-8. The internationally designated Marazion Marsh Special Protection Area (SPA) is supported by four nationally designated Site of Special Scientific Interest (SSSI), three of which are designated for their geological significance, and, at the more local scale, by the Country Wildlife Sites that extend from Marazion through to Penzance across the Eastern Green / Longrock frontage.

In addition, Mount's Bay contains a Marine Conservation Zone (MCZ), covering the eastern part of the bay.

Figure 3-8. Nature Conservation Designations

From the description of future coastal change (Section 3.2), it may be understood that, with sea level rise and increased pressure on shoreline, there is a significant risk to the SPA as a freshwater environment.

Key activities that might result in change or damage to the Marazion Marsh SPA include:

- recreational disturbance
- inappropriate coastal management/coastal defence works,
- failure of defences and
- potential impacts to freshwater and brackish habitats and vegetation management.

These activities all relate directly to the way in which the coast might be managed into the future.

In particular, future natural development of the Marazion Dunes (which is excluded from the SSSI and SPA, but which are designated as a Country Wildlife Site) plays a critical role in maintaining protection to the marsh area behind. To a degree, the requirement for managing this area is exacerbated by issues relating to the Coast Path, whereby coastal squeeze might increase conflict between damage to the vegetation and resilience of the Dunes as a natural defence and the use of the Path, as the width of the dunes is lost.

These issues, therefore, pose significant challenges at the specific local scale in terms of direct management, but also at a broader scale in term of sustaining the integrity of the important national and internationally designated sites, critical as features within the wider area.

This potential conflict extends both to the east (Marazion beach) and west (Eastern Green / Longrock area) in relation to the wider area covered by the Country Wildlife Site, in addition to the potential interaction with the important aspects of the natural and historic and cultural landscapes (Figure 3-9).

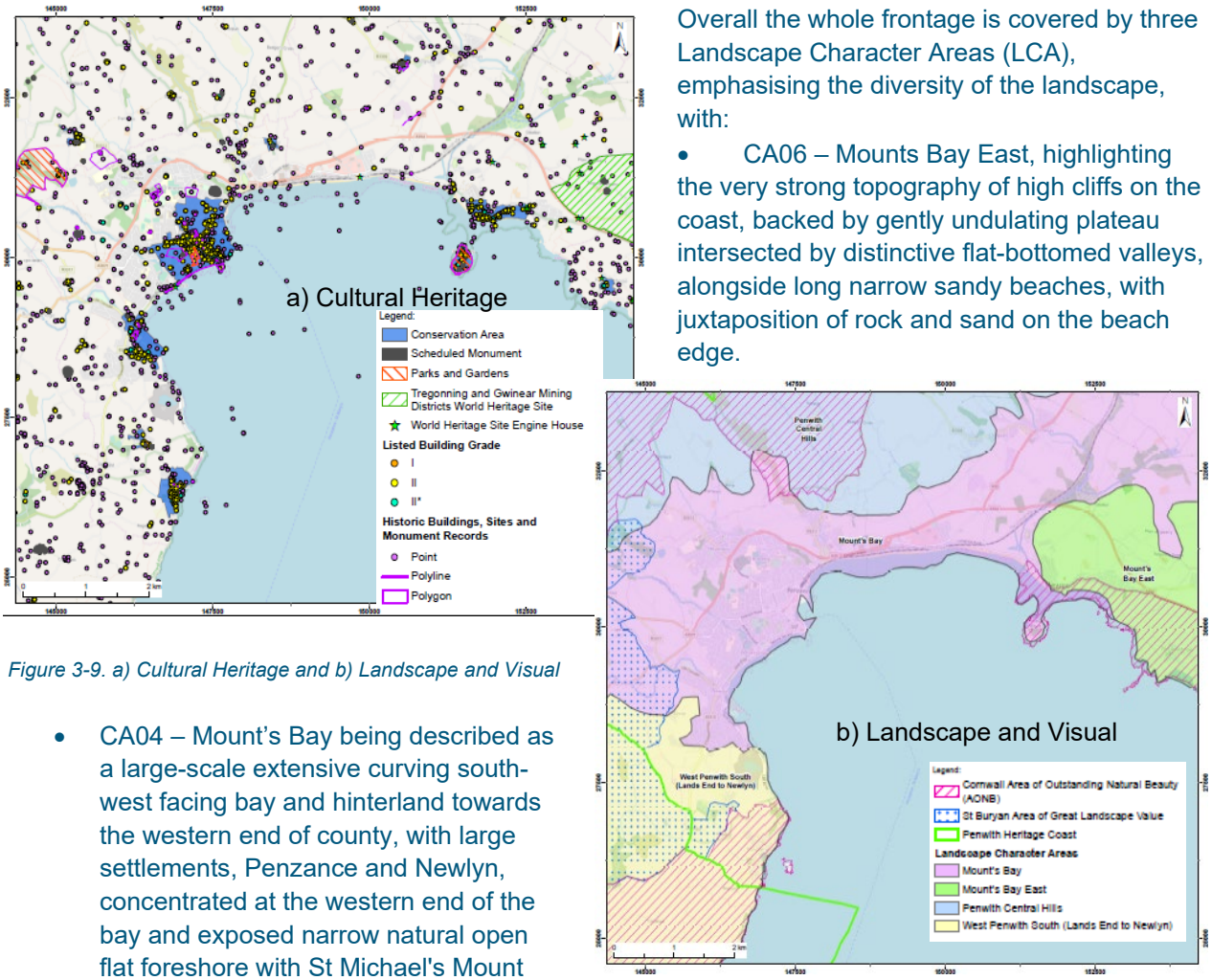


Figure 3-9. a) Cultural Heritage and b) Landscape and Visual

Overall the whole frontage is covered by three Landscape Character Areas (LCA), emphasising the diversity of the landscape, with:

- CA06 – Mounts Bay East, highlighting the very strong topography of high cliffs on the coast, backed by gently undulating plateau intersected by distinctive flat-bottomed valleys, alongside long narrow sandy beaches, with juxtaposition of rock and sand on the beach edge.
- CA04 – Mount's Bay being described as a large-scale extensive curving south-west facing bay and hinterland towards the western end of county, with large settlements, Penzance and Newlyn, concentrated at the western end of the bay and exposed narrow natural open flat foreshore with St Michael's Mount being the major landmark.
- CA01 - West Penwith South (Land's End to Newlyn) having an exposed open maritime landscape character, windswept and highly influenced by wind and weather and having a dramatic and heavily indented granite coastline with fishing villages in small coves, with open, extensive views, outstanding across Mount's Bay on the eastern side.

In relation to the eastern section of the Bay, in addition to the general description provided by LCA CA06 and CA04, the area of Marazion and Marazion Dunes sits within one of two specific areas covered by the Cornwall Area of Outstanding Natural Beauty (AONB). More locally, Marazion also falls within its own Conservation Area, highlighting both the attraction of the core area of the Town but also the more open space and beach aera to the west of the Town.

The County Wildlife Site, over the eastern side of the Strategy area, sits as an integral part of this broader landscape. The County Wildlife Sites, identified and selected during the 1980s and 1990s, were selected because of their high nature conservation value and based on distinctive, important or threatened species and habitats, in either a national, regional or local context and aimed to link and buffer other important areas for nature conservation, such as SSSIs.

While including the Marazion Dunes, discussed above, the site also includes the foreshore and rock outcrops in the area of Marazion, merging with the more specific features of the MCZ, and the intertidal

foreshore associated with the Eastern Green / Longrock frontage. Over this latter frontage, and to a lesser degree (or over the longer term) the Marazion frontage, the natural development of the foreshore has been severely constrained by the imposition of hard defence. Over time (as discussed in Section 3.1), there has been a progressive loss of the upper beach width, with progressive loss of the narrow areas of scrub dunes at the crest of the beach. This appears to have accelerated over recent years, with this area of upper vegetation, and part of the diversity of the frontage, becoming more vulnerable to erosion under storms. This loss, which is already critical, will become worse with sea level rise.

Within the Strategy, potential opportunities to re-establish beach width have to be considered, with the further risk that future reinforcing and hardening of defences will extend the loss of sediment and the foreshore more generally, with the associated risk of increasing the separation between land and sea, impacting on the landscape, use of the beach and use of the Coast Path.

Further west, and notwithstanding the grouping of the area including Penzance through Newlyn within the LCA – CA04, the coastal landscape, use and values changes from the more eastern area discussed above. With the dominance of the towns of Penzance and Newlyn and the two main Harbours, alongside the more intense development of the sea front along the Promenade, the area has a more “built” character, which is reflected in the clustering of listed buildings and the definition of both Penzance and Newlyn as being within their own Conservation Areas.

This built character is also reflected in the absence of primary ecological designations (SPA, SSSI or CWS), although there are areas of priority habitat such as the exposure of intertidal mudflats within the Harbours (being one of the few examples of this within the wider area) and the important intertidal rock outcrops, such as Battery Rocks or Wherry Rocks.

Within, or associated with the area are:

- the local area of shingle behind the Wherry Rocks, with little width for upper beach along the rest of the main frontage, and the area of shingle and sand beach seaward of the Newlyn South Pier, retained by the Harbour structure.
- the valleys of the two main rivers; the Newlyn Coombe River and the Lariggan River; with the latter wider, low lying valley having been cut off from the influence of the sea sometime during the 19th century.
- and the open recreational area, the Foster Bolitho Gardens, to the west of Wherrytown, with this area at risk of being increasingly disassociated from the sea by current defences and the potential need to raise and reinforce defences in the future.

The long term historic constraint imposed on the area by coastal defence and harbour development, appears to constrain opportunities for habitat and ecological restoration. However, even within this heavily modified area, the strategy has to consider how different forms of management might generate opportunity for creating width for upper beach retention and restoration, for consideration of how the width of the Foster Bolitho Gardens may be used to create a more connected approach between the recreational area and the foreshore, and the potential for opening the Lariggan Valley. This former opportunity, considering how the exposure of the frontage may be reduced, needs to be considered quite immediately, alongside consideration of how this might improve opportunity for use of the Promenade, and with the opportunities within the river valley and the Foster Bolitho Gardens being developed in more detail over the slightly longer term.

Alongside this, further examination is required; building on the current work being developed by the Environment Agency in relation to kelp, looking at how the need for and form of defences might be

adapted to create opportunity for new habitat, potentially generating the opportunity for natural carbon capture.

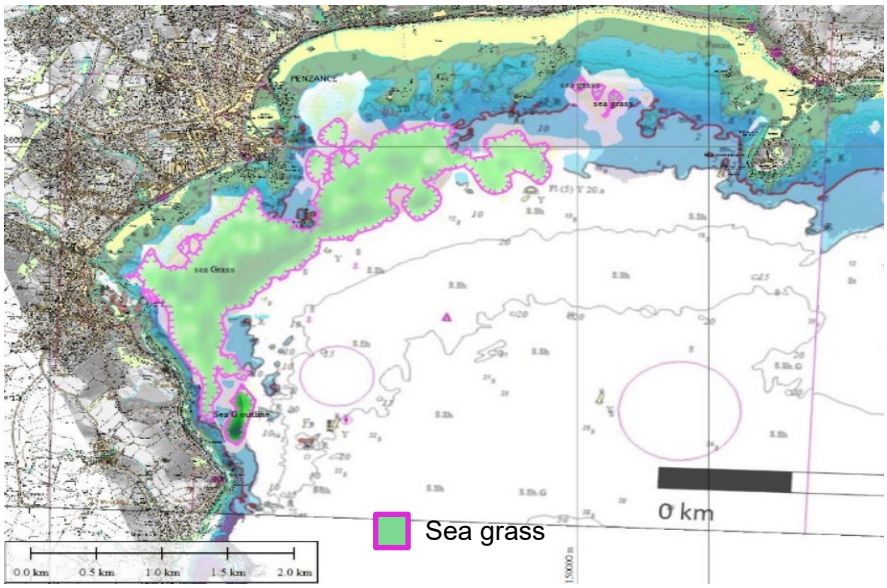
Along the area between Newlyn and g Mousehole, the coast is far more constrained by natural rock. While there is less scope for major strategic delivery of environmental enhancement, there may be local opportunity for enhancing or mitigating any impacts of continued management on the natural system through reconsidering the form and function of defences. This does not detract from the important consideration of critical designations such as the SSSIs or the important landscape quality of the area.

Stepping away from the focus on the immediate shoreline and hinterland zone, discussed above, there is the need to consider also the wider maritime area. At present, the main focus is on the extent and features of the MCZ. However, this designated area is under constant review, with further investigations being undertaken to improve the understanding of this area. While immediately important and relevant the current features identified by the MCZ, the Strategy has to consider the broader potential influence of management options over the wider area.

Most recently, further investigation has been carried out looking at the extent and occurrence of sea grass, with sea grass being recognised as an important and important aspect of the ecological system but also, now being recognised as providing opportunity for natural carbon capture.

Preliminary results of the mapping are shown in Figure 3-10.

This mapping shows that, in fact, the main areas of this natural resource occur more over the western frontages, beyond the current extent of the MCZ, with much more limited occurrence in the area of Longrock and Marazion.



Initial analysis of these areas (undertaken for the Strategy, while awaiting the more detailed analysis being done by others) would suggest that:

- The present extent of sea grass sits generally (but quite consistently) between -5m and -15m OD.
- that the extent is limited by the presence of rock outcrops.

Figure 3-10. Preliminary results of sea grass mapping.

While the latter point is possibly self-evident, in that exposed rock would be unlikely to provide the necessary substrate for sea grass, this might also be associated with inherent higher degree of exposure to waves and tidal flows.

This issue of exposure, is considered to be one factor influencing the extent and location of sea grass, such that the bias of occurrence towards the western area may be a reflection of the change in wave climate across the area, while the depth of occurrence may reflect the necessary depth to avoid significant disturbance more generally of the sea bed by the large long period waves.

As a more detailed understanding is developed, such findings will need to be fed in to the implementation of the Strategy, looking further at the opportunity for encouraging or actively enhancing the development of this sea grass resource. Typically, however, at this time it might be concluded that increasing disturbance of the sea bed, such as increasing reflected waves back over the foreshore and nearshore areas might be considered as having a potentially negative impact, while reducing such wave reflection or increasing areas of shelter might be considered to provide greater opportunity of sea grass growth.

At the strategic level, the above discussion demonstrates that there are important areas for the Strategy to consider both in terms of potential negative and positive impacts on the natural environment and landscape.

In particular, such negative impacts tend to appear where the shoreline is fixed as a line between the dynamic environment of the coast and a the harder approach to management of features within the hinterland. In contrast, therefore, where a more adaptive approach can be developed, even at a relatively local level within areas of more intensive historic protection, such as the Promenade, there are strategic benefits that need to be considered, potentially delivered through greater adaptation.

As such, a key driver for the Strategy, in delivering environmental growth objectives alongside sustaining and improving the integrity of existing important environmental features and designations is the need to consider:

- the ability to create width within the shoreline system,
- the opportunity for creating a more dynamic or responsive approach in terms of the form of defence, in particular creating the opportunity to retain or supply additional sediment to the system, and
- creating opportunity for aspects such diversity and carbon capture through use of form and materials, with, in some areas, this needing to be developed further as the Strategy is implemented. Critically, the Strategy aims to provide an approach within which this opportunity is not constrained.

This all has to be considered in a balanced manner in terms of impacts on the natural environment, recognising that any form of management within such a presently constrained environment will result in change to what is there. Alongside this, is the need for balance with the broader level strategic drivers in relation to the wellbeing of communities and the important regeneration of the economic potential for the area. This is discussed in outline below.

These aims, captured within the strategic objectives (Section 2), align well with the intent for change, Place-Making and reconnecting the sea and land as set out in the principles of local Neighbourhood Planning.

3.3.2 The Built and Economic Structure

A more detailed description of local areas is provided below in Section 3.4 with this current sub-section considering these aspects at a more strategic integrated level. As with the section on the natural environment, above, further detail is provided within the SEA.

The Penzance Neighbourhood Plan (PNP), while being developed from a local community level and focussed principally around the Penzance to Mousehole section of the coast, provides at least in part, the strategic context for the Strategy. The PNP sets out a vision for change and improvement across the whole of its area, recognising the different values and potential of areas, linking this through more as a journey from the important Gateway in the east, through Penzance Harbour and Promenade to the distinctive character of the historic and important operational fishing harbour at Newlyn. An underlying theme is that of reconnecting the hinterland with the sea, while still maintaining connectivity, supporting opportunity of economic regeneration, increasing the use of the seafront and sustaining the important landscape. This is supported at the broader level by Cornwall's Place Shaping initiative, recognising the need for specific projects contributing to the identity of the area.

Within this overall context, certain specific aspects of value are seen to cross cut the particular character of local areas, but with broader strategic relevance to the wider area.

The main economic sectors are the service industry, manufacturing and tourism. Traditional activities such as agriculture, mining and fishing have been in decline for over a hundred years, although still contributing to the economy today. Newlyn Harbour contributes significantly to the local and national economy.

Penzance is the most important local employment centre. Critical to the economic regeneration of Penzance, and therefore the wider area, is the development of the commercial and business centres within Eastern Green and Longrock areas. This development is likely to have contributed to increased employment in recent years.

Section 3.2 highlighted the increasing pressure for coastal change over the whole area and the significant constraint imposed by the main Harbours. Over the longer term, failure of the Harbour structures would result in major change and rapid loss to the built environment, the economy and changing the socio-economic structure of the area. Even so, the Strategy has to, as a baseline, consider this impact on the local and wider area, alongside considering how approaches to management of these frontages may influence the ability to manage adjacent areas.

Potential loss of the Harbour structures and the associated impacts highlights the issue of responsibilities for management, emphasising the need for collaborative working, where local responsibilities overlap with the aim to provide a coherent approach to management of the full area.

Closely linked to the core economic areas is the interconnectivity and transport linking to and across the Mount's Bay area (Figure 3-1).

The main railway line runs along the Eastern Green / Longrock frontage, having been constructed along the back of the beach through to the station within the Penzance Harbour area. This railway, which imposes a significant constraint in terms of allowing natural development of the shoreline, provides important links through to other communities within Cornwall as well as linking other areas of the UK. As identified within the PNP, this transport link is a very real gateway to Mount's Bay.

Associated with this, running through this Eastern Green / Longrock corridor is the main A30 road. While set back from the shore, this road lies within the lower lying land at increased risk from flooding and inundation. The A30 continues to the back (in land) of Penzance, providing interconnectivity with areas to the west of Penzance and more generally to the whole of the Penwith Peninsula.

The A30, on the eastern side of Penzance, feeds into the main coastal road along the back of the defences to Chyandour, through the Harbour, along the Promenade, through Newlyn, connecting through

to the coastal road to Mousehole. While this transport network relies critically on maintaining the A30 through the Eastern Green / Longrock area, there are areas potentially vulnerable to coastal change within Penzance Harbour area (principally from future flood risk) and more directly in terms of erosion along the Promenade. There is a link between the A30, further in land, and the coastal road, running up the steep Newlyn Coombe Valley. However, this connection relies upon maintaining defence to the core area of Newlyn, which itself critically depends upon the continued management of the Newlyn Harbour structures.

To the east of the whole area, the A30 links through to the A394 to the back of Marazion, with the local coastal road network running along the front of the Marazion Marsh, through Marazion and Trevenner, reconnecting to the A394 to the east of the Town. This connectivity is at risk both over the Marazion Marsh area and, potentially over the longer term, due to the recession of the natural cliffs and coastal slope to the east.

Again, the point being highlighted is that there is significant interdependency between specific frontages and the integrity of the whole transport network across the larger area. While full consideration of this lies beyond the detailed scope of the Strategy, there has to be a strategic approach taken to this, such that, the strategic importance of local management considers the impact more generally.

A similar strategic approach is also required in relation to the principle services. Decisions made with respect to an important feature such as the SW Water Pumping Station, located within the Penzance Harbour area, has to be considered alongside various services running along both the Eastern Green / Longrock frontage, the Promenade and extending this to include such features as the Pumping Station at Marazion.

Active transport is equally important to the area, with the nationally important Coast Path running through from Marazion along the whole length of the coast through to Mousehole. This path and cycleway is particularly vulnerable over the Eastern Green / Longrock area, not just being vulnerable of physical loss due to erosion but also in terms of it character, attraction and, therefore, use, with this being influenced by any approach taken to the form coastal defence. There is the risk either that the path is lost due to erosion or is increasingly separated from the shoreline behind the need for more massive defences.

The PNP, identifies the vision for the Promenade area, emphasising its use for active transport and activity. This area is equally at direct risk due to coastal change or by being detrimentally affected by the need for higher more massive defences in response to coastal change. It is noted that this Promenade area has recently been substantially improved, with significant investment, tying in with the major Place Making improvements and investment to the Jubilee Pool. This highlights the need for an approach over the longer term, linking the vision for use in collaboration with providing a sustainable integrated approach to shoreline management.

The transport network, including the important external connection, the active travel routes, the use of the area and maintaining the underlying historic and cultural values (alongside the sustaining a thriving natural environment and maintaining the important landscape) are all critical in delivering benefits for recreation, health and wellbeing and the wider economy, particularly in terms of the value of tourism.

Over the whole area, tourism is a major industry supporting the local and regional economy - although at present reliance on tourism can also impose constraints, offering relatively seasonal, often low paid work. A key aspect of revitalising the area is in making greater use and awareness of the coastal environment, supporting greater diversity associated with a more sustainable approach to tourism. This clearly links with the existing important features such as Mousehole, the Promenade and Jubilee Pool and St Michael's

Mount, recognising also the important Areas of Outstanding Natural Beauty and the more local conservation areas associated with the main towns.

In the case of St Michael's Mount, this is closely linked to the car parks associated with the western part of Marazion, while elsewhere across the area, there is the strong emphasis on connection with the sea, both visually and in term of access. To a large extent this again re-emphasises the concept of width and the need to develop the concept of a shoreline zone, integrating both use of the hinterland and creating width within which the actual shoreface can function.

At the wider strategic level, applying such a concept may differ between areas, recognising that we are building forward from what is there. Recognising this difference in itself introduces the opportunity for diversity.

In the case of Mousehole, there is limited scope for change without loss of core values. The same might be extended to the two main Harbour areas, although consideration of more local enhancement of these areas may be possible.

Over the Promenade area, notwithstanding the need to consider the baseline or more local need for realignment (e.g. along the Foster Bolitho Gardens area and the Lariggan Valley), the current integral existence of the sea wall and the promenade imposes significant challenge for major change. However, within this essentially strongly constrained (built) environment the Strategy has to focus on how different forms of on-going management may be adapted to create effective width within the system, supporting the PNP concept of activity and reconnection. This has to be closely linked with future use of the Promenade and a more formalised use of the built environment.

The Eastern Green / Longrock frontage offers greater opportunity for changing the form of defence within the existing more natural long sweep of the bay, while still recognising that the railway line currently imposed a backstop limit for adaptation. In this area, a key aspect of adaptation has to focus on restoring and enhancing the existing natural width, which would be lost under the current approach to reactive hardening of a linear defence line.

Such an approach has to be extended in examining approaches to management of the Marazion area, constrained by the need to maintain the integrity of the Marsh and the present protection to the core of the Town, but looking at ways that the adaptive management of the Longrock frontage may be applied to the dunes and the western part of Marazion. Approaching management from this perspective there is the opportunity for maintaining the important diversity of use across the whole area.

Figure 3-11 attempts to capture the primary features discussed in both the previous sections, highlighting the broader scale diversity of use and value across the main area of Mount's Bay that needs to be developed through the Strategy for flood and coastal change risk management.

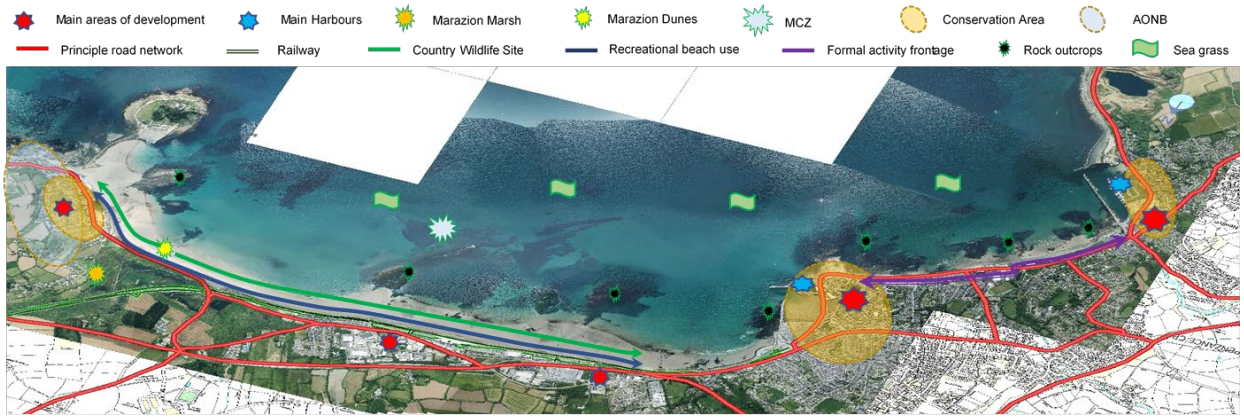


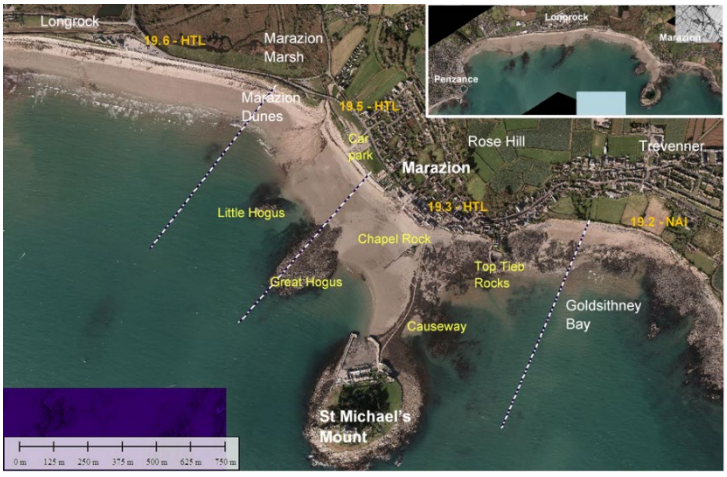
Figure 3-11. Principal strategic aspects of the strategy area (excluding Mousehole).

This strategic assessment is considered with respect to each individual local area.

3.4 Local Area Descriptions

Marazion (Figure 3-12)

Dating back to its first charter of incorporation by Henry III in 1257, Marazion is recorded as being the main town in the area until the late medieval period, before the growing importance of Penzance.



Marazion is designated as a Conservation Area and part of the town falls within an Area of Outstanding Natural Beauty (AONB). The Conservation Area designation highlights the importance of open spaces both within the main Town and the lower lying area to the west.

This western area of the Town also provides essential car parking areas, which serve a vital role in preserving the character of Marazion, reducing the volume of traffic travelling through the town during the busy summer period.

Figure 3-12. Marazion

While recognising that Marazion is also an important residential area in its own right, Marazion is also integrally linked to tourism and access associated with St Michael's Mount; via The Causeway and the ferry service from the jetty at Gwelva and the harbour at Top Tieb. Marazion's historic importance, together with its unique character and facilities, make it one of the most significant tourist destinations within the area, with nearly half a million tourists each year.

Situated to the eastern end of Mount's Bay, it is also considered an important way point along the South West Coast Path. This is set in the context of the areas important natural ecological and visual landscape, with rocky outcrops and sandy beaches and with the backdrop of St Michael's Mount.

The beach and rocky outcrops are designated within the Mounts Bay Marine Conservation Zone (MCZ) and Marazion Marsh, to the western end of the Town, is of international importance with its designation as a Special Protection Area (SPA) associated with its freshwater marsh.

The older part of the Town is defended by a range of generally old masonry walls, with property directly to the rear of the defence on higher ground. To the western end of the Town, the more open ground was formally defended during the early 1990s, providing protection to the main car park and various other various facilities, including the sailing club. This defence also provides protection to the main road running to the back of the open space at a slightly lower level.

While the defence to the core of the Town has been constructed to rock, at its eastern end these defences tail out to the eroding cliffs of Goldsithney Bay. The defences to the lower lying western end, and protection they afford, is more dependent on the beach and, as such, is far more susceptible to the long term change discussed in Section 3.1. Similarly, the dunes, further to the west of the town, providing protection to the road and the area of the Marsh, will be susceptible to erosion with sea level rise. Critical to sustaining these defences and the beach area will be the degree of continued sediment supply from the west.

Eastern Green and Longrock (Figure 3-13)
While there was some limited development in areas around the higher ground of Longrock and Chyandour prior to the construction of the railway, with some further development around Longrock over the subsequent years, the area was more extensively developed in the 1960s and 1970s.

Longrock and Eastern Green is now considered to be an important commercial development area, supporting economic regeneration of Penzance and southwest Cornwall, providing essential retail space and areas for business development alongside existing residential housing (Figure 3-13). Alongside this, the area provides the main transport route to Penzance and, more generally, through to Newlyn and the Penwith Peninsular to the west, being recognised by the Penzance Place Shaping initiative as the strategic Gateway to the wider area (Figure 3-14)..

Figure 3-13. Eastern Green and Longrock

At present the frontage is protected by a continuous embankment, which has itself been protected against erosion by a series of hard defences. The South West Coast Path runs the full length along the embankment.

At the eastern end there is an important car park in the area of the old Longrock railway station, with another car park, seaward of the railway line, in the area associated with the main level crossing. The only other access point to the Coast Path is via the footbridge at Eastern Green.

There is a popular upper beach along much of the frontage, with a much wider intertidal beach popular for more active use over lower water levels. Due to the longer term loss of beach, coupled to the construction of defences, access along the full length of the beach is limited at high water.

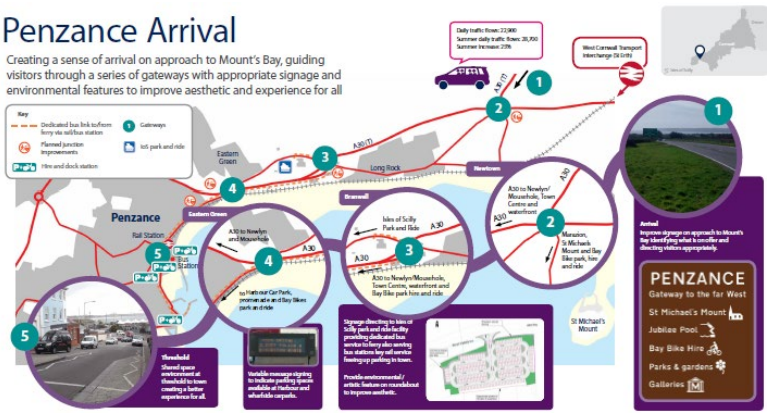


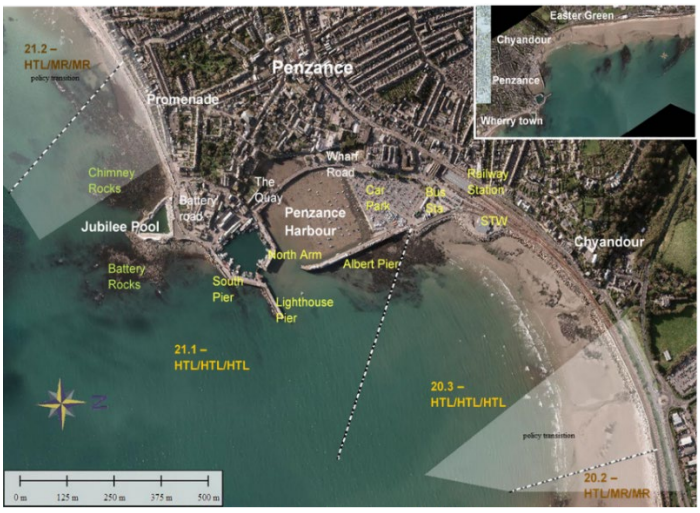
Figure 3-14. Penzance Gateway.

The Ponsandane and the Longrock Streams flow out across the beach. There are two further piped outfalls from the area of Eastern Green and that associated with the Varfell Stream running through the area of the Marazion Marsh.

The nearshore to offshore area, over the eastern part of the frontage, falls within the MCZ designated area.

Coastal change will influence the sustainability of defences, with the existing pressure on the frontage increasing with SLR, resulting in further beach loss. In addition to the risk this introduces to local development, this has to be considered alongside the continuity and use of the shoreline and the important strategic transport corridor that provides interconnectivity between Marazion and Penzance.

Penzance (Figure 3-15)



Penzance is an important local employment centre, with over 40% of the employment in the former Penwith District (based on 2007 data), closely linked to both to core Harbour area and the commercial and retail development within the Easter Green area (discussed above).

The Penzance Harbour area was substantially developed during the mid - nineteenth century with the construction of the Albert Pier, the extension of the South Pier and provision or improvement of existing wharves, docks and warehousing.

Figure 3-15. Penzance Harbour Area

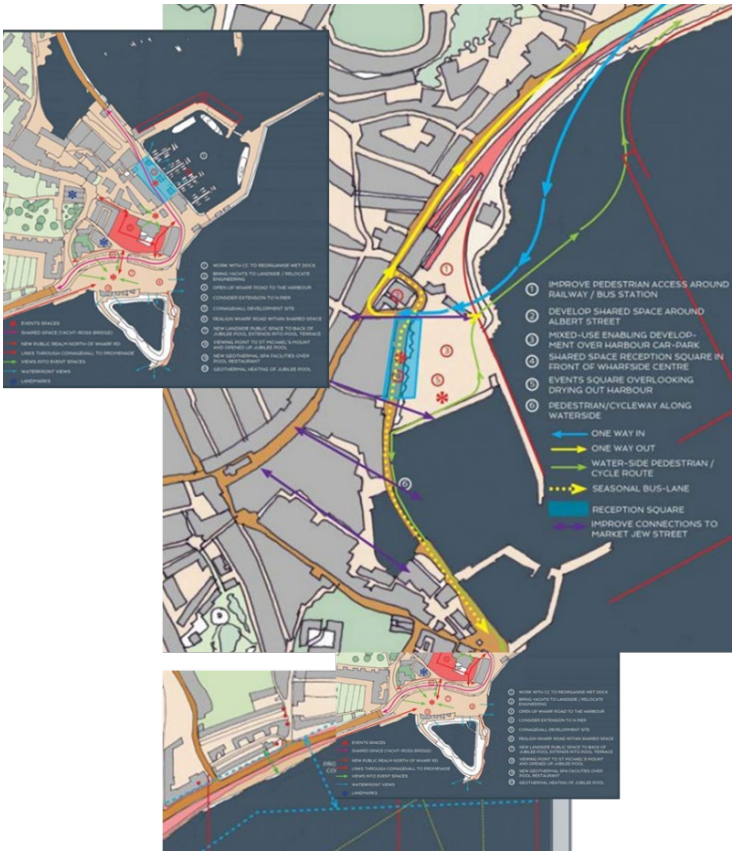
The main piers, together with the dry docks, the defences around the Abbey Turning Basin, various buildings to the back of the Quay and the Jubilee Bathing Pool are all listed structures, within the wider Conservation Area covering the Harbour and the Town.

The mainline (London to Penzance) Penzance railway station is situated within this area, providing a strategically important transport hub for tourism and business, with links locally via the bus station and, via the ferry connection, to the Isles of Scilly. Within the Harbour area is one of the main long stay car parks, servicing the Town.

The main road runs along the Chyandour Cliff, to the back of the railway line through to Penzance town centre, as well as continuing along Wharf Road, the Quay and Battery Road, to the back of the Harbour, through to the Promenade and on to Newlyn.

Specific zones within the area have been identified and discussed within the emerging PNP, including The Threshold, Reception, Headland and The Jubilee Pool and Promenade regeneration sites (Figure 3-16). The Plan recognises that in developing the regeneration of the area, there is a need to reconnect with the sea, driving the need for a string of economic and activity nodes.

A key aspect of these plans is maintaining and improving the connectivity across the wider area, in particular, with a view to maintain and enhance the route of the South West Coast Path and the development of the continuous cycle way.



The frontage is heavily modified with extensive rock armour, seawall, harbour and pier structures. The Harbour structures, in addition to their harbour operational function, protect the important infrastructure associated with the waterfront of the Town.

The Harbour structures are constructed upon the more resistant rocky outcrop of hard Devonian slate, with rocky outcrops adjacent to Albert Pier, Battery Rocks and Chimney Rocks (Figure 3.15) but are in relatively poor condition.

Quite obviously, management of this area has strong association with management of the adjacent frontage of Eastern Green, the Promenade and the wider area, both locally in terms of managing the continuity of defences but also in terms of the Harbour area's strategic function and core position within the whole area of Mount's Bay.

Figure 3-16. Penzance Neighbourhood Plan.

The Promenade and Wherrytown (Figure 3-17)

The Promenade frontage (Figure 3-17) forms the core seafront area of Penzance, the coastal through-route for cars, as well as forming part of the South West Coast Path.

The western section of the road (primarily the New Road section) along the frontage provides an important route from Newlyn through to the A30. Commercial vehicles from Newlyn Harbour use the road rather than the more direct route along the Combe Road due to the narrowness of Combe Road. These vehicles are encouraged to head north along Alexandra Road, rather than taking the route along the Eastern Promenade and through the Penzance Harbour area.

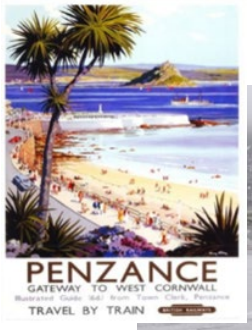
At the northern end of the Promenade is the recently refurbished Jubilee Pool, now being a major attraction to the seafront of Penzance. Associated with the Pool is the area of the Battery Headland, identified as, potentially, an important open space viewing point.

Immediately south of the Battery, the properties making up the seafront are generally slightly set back with front gardens set back behind the main road. The properties provide important tourism accommodation, with several major hotels along the seafront. There have been properties along the Western Promenade since at least around 1875.

Figure 3-17. Promenade and Wherrytown.

The Promenade, itself, is relatively narrow at its northern (eastern) end, widening as it extends through to Wherrytown, where some twenty properties were removed to create this wider space. There is some commercial retail property to the rear of the promenade and road, at Wherrytown, on the edge of the Lariggan Valley..

The Lariggan River cuts through the frontage just south of Wherrytown, with the valley widening further upstream. This valley area contains the home ground of the Cornish Pirates RFC alongside other amenity space.



To the south of the river mouth is the open space of the Foster Bolitho Gardens, on a gradual slope up to the New Road, linking through to Newlyn. At the southern end of the gardens is the Tolcarne part of Newlyn, with property protected by a sea wall and rock revetment.

While recognising the importance of the entirety of the promenade frontage to Penzance as a whole, this is seen as space for opportunity within the Neighbourhood Plan identifying that currently:

Figure 3-18. The Promenade actual and aspirational.

- The Promenade is a vast linear space, with the potential to be considered more as a corridor of activity rather than a linear space, all within the broader concept of reconnection with the sea.

- Wherrytown is a fractured piece of townscape that houses edge of town stores with large parking courts, identifying the opportunity for a mixed use of leisure / residential development, which link the Promenade with the rugby club and create active uses to compliment the Promenade.

While the FCERM Strategy cannot directly pursue these opportunities, the broader scale strategic opportunity can be reflected in the way in which FCERM is undertaken, alongside consideration of flood issues and environmental opportunities, in part associated with future management of the Lariggan River and outfall.

At present the defences provide an imposing barrier between the sea and the use of the promenade and are a far cry from the rather aspirational view shown in the past image of Penzance portrayed by the Great Western poster (Figure 3-18).

Newlyn (Figure 3-19)

Newlyn, situated to the south of the Promenade, is defined by a conservation area which covers most of the settlement adjacent to the harbour.

Newlyn Harbour is an important economic zone closely linked with Penzance and Mousehole. The Harbour has one of the largest fishing fleets operating in the UK with more than 600 vessels of which 69 are offshore vessels, with the remainder being smaller inshore craft. The Harbour typically accounts for 3.2% of the total UK fish landings by weight and 4% of the total value, contributing significantly to the local and national economy.

The Penlee Lifeboat Station, situated within the Harbour is home to an all-weather Severn Class Lifeboat and is supported by a smaller inshore craft. In addition, the Harbour offers round the clock refuge to those vessels that fish the Southwest Approaches. The North Pier is also where the Cornwall Inshore Fisheries and Conservation Authority's (IFCA) berth their largest fisheries patrol vessels.

Figure 3-19. Newlyn

The Harbour, originally focused around the Old Quay, dates back some 500 years with major improvements being made during the 19th century. The main harbour structures (the North and South Piers) were constructed in the mid-1880s, with the lower lying area to the back of the harbour (the Strand) being reclaimed over a former beach area. The Mary Williams Pier was constructed in 1980 providing important mooring areas principally for smaller vessels, with the extension of the Fish Market in 1995.

The area is cut by the Newlyn Coombe River, which has historically been affected by significant flooding and overtopping due to a combination of both tidal and fluvial events. The lower bridge across the Newlyn Coombe River, at Jack Lane, used to be the main route into Newlyn from the east with the main road running along the Tolcarne Inn frontage. The transport route has since been replaced by the New Road set slightly further inland.

The seaward side of the Tolcarne area consists largely of Victorian terraces of granite cottages and houses, although the Tolcarne Inn (Grade II) dates from 1717 (Newlyn Conservation Area Statement). At the northern end of this area is the Newlyn Art Gallery, an important visitor attraction. This area forms a gateway to Newlyn town centre. It provides an important link between Newlyn and Penzance.

The area to the west of the mouth of the Newlyn Coombe River was developed during the early 1900s as the urban core, close to the new Harbour, with purpose-built shops, a bank, cinema and other structures. These were matched by 'maritime' buildings of comparable quality such as the prominently sited Royal National Mission for Deep Sea Fishermen (known as the Ship Institute) and Lifeboat House. This area remains the main core area of the town.

The main area of the Strand and reclamation associated with the construction of the Mary Williams Pier is developed as part of the Harbour complex, with older properties on the rising land behind.

Further to the south, the original village developed in association with the Old Quay, on the rising land to the back of the old Harbour area, as highlighted by the number of listed buildings.

Newlyn, however, is marked by significant levels of economic and social deprivation. It is included in Penzance South ward, which is among the worst 20 per cent of deprived wards in England. This is recognised in the development of the Penzance Neighbourhood Plan, highlighting the aspirations for regeneration of the area, developing upon the area's important historic context.

This Neighbourhood Plan highlights key aspects of the area:

- With the intent to maintain and support the development of the core commercial area around the Newlyn Combe River,
- Recognising the importance of the main transport route from the New Road bridge over the river along the Strand, with
- The associated Coast Path route along the Tolcarne Inn frontage and then behind the Harbour maintaining continuity of the path to the south, and
- The mixed use area around the Strand.

To the south of the South Pier, the area of Sandy Cove is identified for further development as Mount's Bay Maritime Engineering Zone.

Mousehole (Figure 3-20)

Mousehole has developed around its Grade 2 listed Harbour, dating back from as early as the mid 1200's and is contained within the larger Conservation Area covering much of the Village. While the nature and use of the Harbour has changed substantially over the last 100 years, with the major decline in the fishing industry, the Harbour still provides the core around which the vitality of the village is maintained. The Harbour is run as an independent Trust Port.

The Harbour provides the focus for a variety of festivals and community activities, not least of which is the Christmas Illuminations which attracts thousands of people from all over the world (BBC, 2010), highlighting the strategic importance of the village as a tourism destination within the broader context of the wider Mount's Bay area.

The village remains an important residential area and community in its own right.

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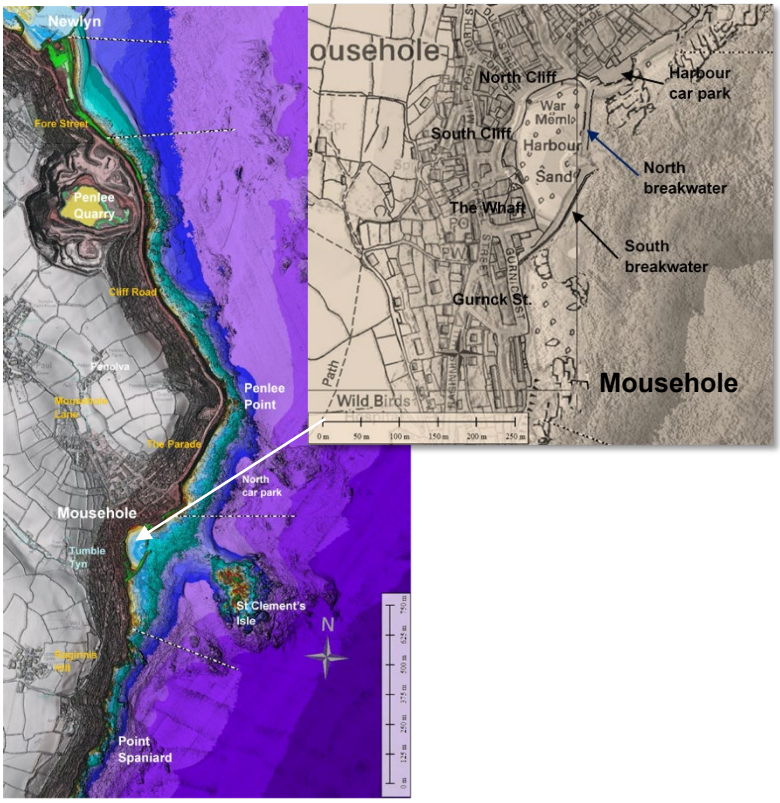
Within the protection of the main Harbour structures, to the back of the Harbour there are a range of defences directly protecting properties and, to the south of the Harbour these defences continue for a short length protecting properties along Gurnick Street.



The main access to the village is from Newlyn along the coastal road. There are alternative routes through the hinterland but these are relatively minor rural roads. The coastal road to Mousehole starts as Fore Street in Newlyn where it transitions into Cliff Road, running parallel to the rocky shoreline to the south. This road forms a continuation of the South West Coast Path.

The road is protected over various lengths and in addition to providing protection to the road defences protect the smaller communities of Roskilly and Skilly.

Figure 3-20. Mousehole

Closer to Mousehole the name of the road again changes to the Parade, with properties more connected to the main Village extending over much of this section. The Parade is protected by defences over its full length.

At the southern end of the Parade is the main car park for the village, seaward of the road. There is a further car park just to the north of the North Pier, protected by a substantial rock revetment.

The frontage contains two Sites of Special Scientific Interest (SSSI); The Penlee Quarry SSSI is set back from the shoreline to the landward side of the road, while the Penlee Point SSSI, just to the north of Mousehole, covers the local headland and rock outcrops at the shoreline. The area including Penlee Point and south beyond Mousehole is part of the Penwith Heritage Coast Area of Outstanding Natural Beauty (AONB).

4 Definition of the Problem and Potential Opportunities

The use of the whole area is fundamentally linked to the way in which defences have been constructed in the past. While these defences provide on-going protection to core values of the area, increasingly they impose a constraint of the way in which the natural coastal environment will develop. This constraint leads to the Problem of increasing separation between land and sea, with further degradation of the limited existing foreshore width, and the need for ever higher defences required to address the problem of wave overtopping and flooding. The Problem being faced is as much related to the impact of maintaining current standards of protection as it is in relation to the major impact that would occur if defences were to be abandoned.

Alongside this, is the need to work in collaboration with other bodies such as the Harbour Authorities in meeting their needs to sustain and improve their operations, as a core value of the area, in considering the impacts and opportunities with respect to the wider environmental and ecological and in working with the various initiatives for improvement of use of the area in encouraging sustainable regeneration and place making opportunities.

From this perspective, this Section of the Strategy report considers both a Do Nothing scenario in identifying the need for continued management and, in a similar manner as the SMP, a management scenario based on continuing to defend in the way in which defence has been carried out in the past. This effectively brackets the need for change (the Problem) highlighting both the flood and coastal erosion risk alongside the problems faced by the potential need for management.

This is taken further in considering the potential opportunities a change in management might create both from an FCERM perspective and in relation to the broader values of the area.

Appendices C1 (Marazion), C2 (Penzance), C3 (Newlyn) and C4 (Mousehole) provide a detailed analysis of the local situation and information is brought through in this Strategy Report. The Strategy Report also brings together the analysis with respect to Newlyn Coombe (Mott Macdonald 2019), Penzance Promenade (Mott Macdonald 2017) and the Longrock/ Eastern Green frontage (RHDHV 2019) as detailed in Appendix A.

4.1 Do Nothing

In total, the length of the Strategy frontage is in the order of 15.5km of which around 14.5km is defended, typically with hard structures. The Marazion dunes and scrub dune area covers some 600m of the frontage, with this length coming under pressure for erosion over the next 20 to 30 years. The only other sections of natural shoreline is along the road through to Mousehole (approximately 250m of rocky shore). Of the hard or managed frontages there is around 9.5km of coastal erosion / flood defence, with a further 1.5km of defence directly linked to the railway line. There are around 3km of Harbour structures with, in addition, around 400m of coastal/fluvial defences within the Marazion Marsh and over the lower length of the Newlyn Coombe River.

Many of these defences are currently managed in an ad-hoc manner relying on emergency funding following storm damage or with a more general patch and repair approach over many years. This do minimum approach cannot be sustained and more major works will be required over the short to medium term. Figure 4-1 shows an assessment of when more major work will be required over different lengths of the frontage based on a local assessment of residual life.

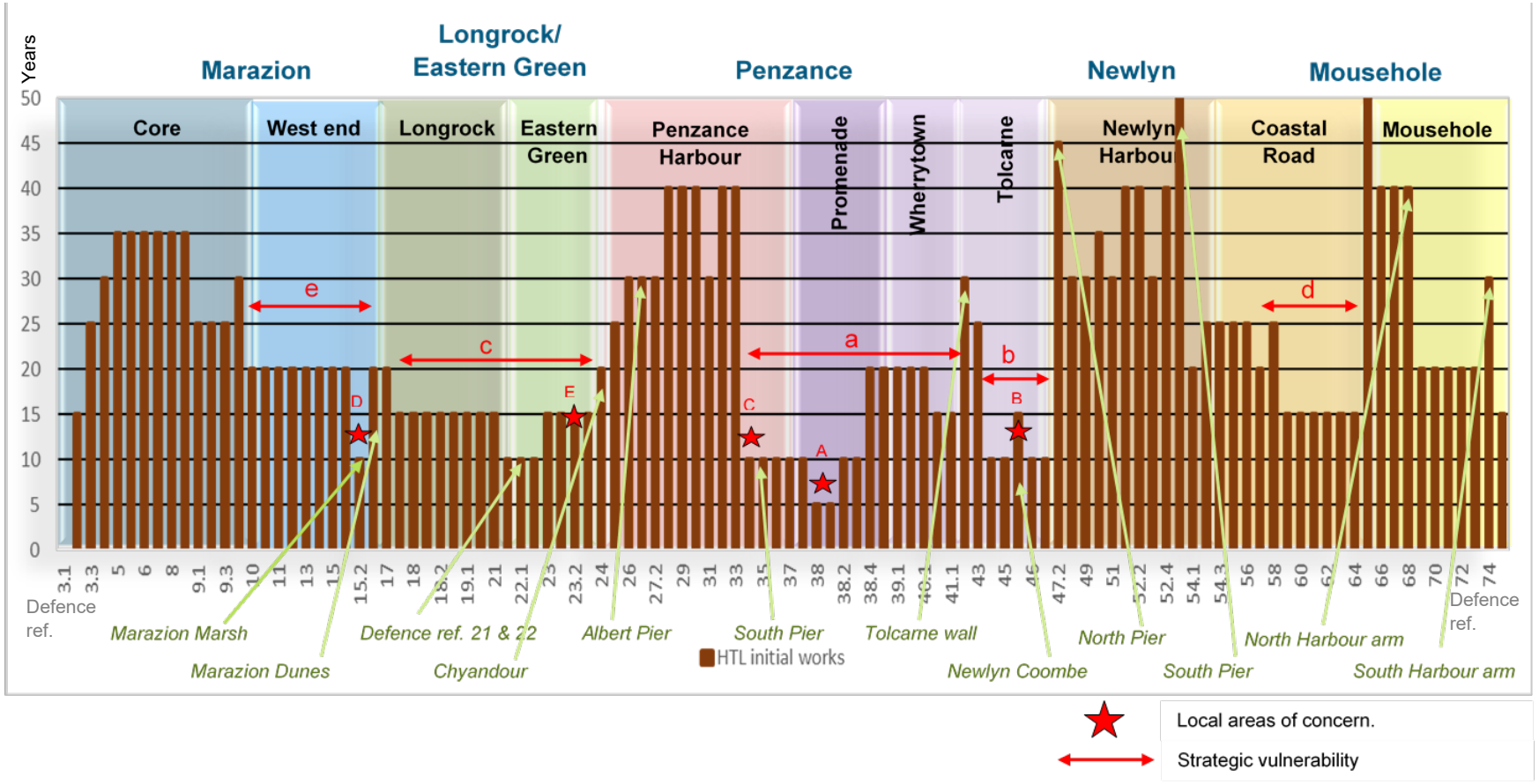


Figure 4-1. Assessment of when significant initial investment will be required.
(Note: Some local lengths of defence have been excluded for clarity.)

4.1.1 Defence failure and areas of risk

Figure 4-1 shows significant variation in when investment is required across the frontage, but with the need for substantial initial investment required over the next 10 to 40 years. In some areas this need arises from present day flood risk due to wave overtopping, with this problem becoming worse with the increasing risk posed by sea level rise in the future.

However, over much of the area there is a more fundamental risk related to the structural integrity of defences, either as a result of on-going deterioration of the many old structures or due to undermining and the destabilising impact of beach loss.

Clearly these two aspects are linked, in that increased overtopping may also lead to crest and back face failure, with rates of overtopping being linked also to falling beach levels in addition to SLR. As defences fail there would be erosion of the effective defence line with subsequent increase in flood and erosion risk to the hinterland (Figure 4-2).

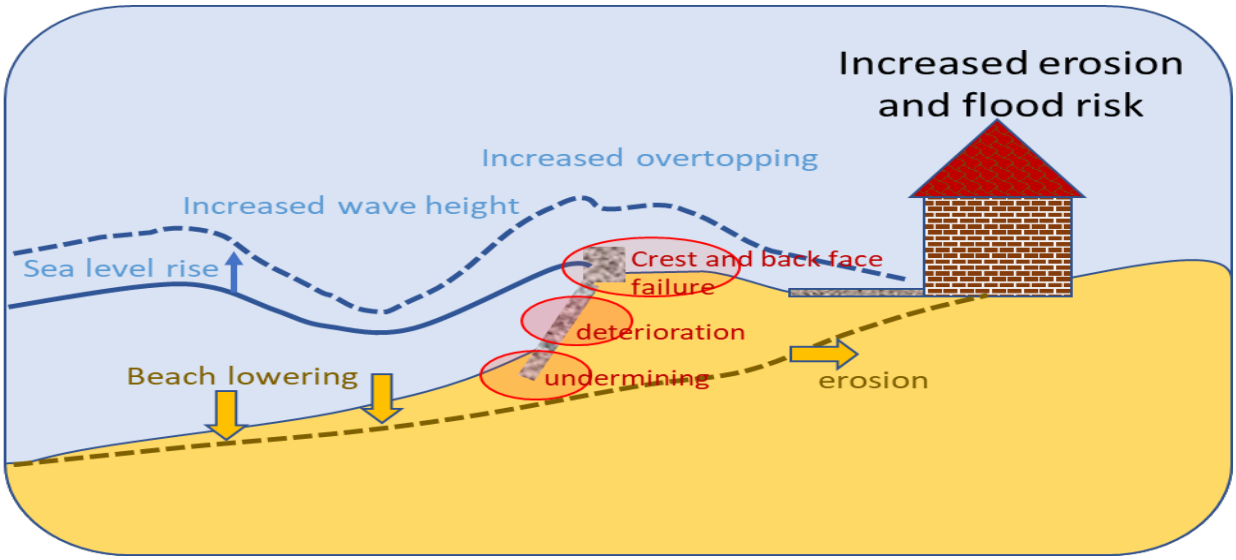


Figure 4-2. Schematic of risk factors.

4.1.1.1 Local vulnerability

The most immediate local areas of concern are shown in Figure 4-1 (highlighted by a red star):

- Location A (*current*) - relates to the excessive overtopping occurring at present to the northern end of the Promenade. (Note more general flood risk occurs over the whole promenade area.)
- Location B (*current*) – relates to the risk of overtopping within the mouth of the Newlyn Coombe River, affecting the central core of Newlyn and areas of Tolcarne.
- Location C (*within 10 years*) – relates to the both the deterioration of Penzance South Pier and the current level of overtopping in this area, impacting at present on the operation of the Harbour but having a wider impact on the defence and flood risk to the whole Harbour area should this structure fail.
- Location D (*10 years*) – relates to the condition of the embankment internal to Marazion Marsh, with the risk beyond year 10 of more frequent tidal (saline) incursion.
- Location E (*current / 15 years*) – high level of overtopping flood risk to railway line on more extreme conditions, with increasing risk due to sea level rise.

Locations A, B and C are at present areas where there are locally important risk factors affecting current use of the area, with location E identified as having a severe risk at present under more extreme conditions. Location D highlights a more strategic longer term risk specifically to the integrity of Marazion Marsh. Over time, though still relatively short term, more strategic risk factors will emerge and these are discussed below.

4.1.1.2 Short-to medium-term strategic vulnerability (by timescale)

Promenade and Tolcarne (2020 to 2035)

Over and above the more local immediate issue of overtopping and flood risk over the northern section of the Promenade, there is the more fundamental issue of deterioration and potential undermining of defences over the whole length (vulnerable defence length (a), shown in Figure 4-1). Typically, this might become critical around year 10, with potential failure of sections of defence over the following 5 to 10 years.

The potential erosion zones, which are anticipated to develop following failure of the defences, are shown in Figure 4-3. The Figure also shows the present day T10 flood extent, currently with defences in place, following defence failure and, over the longer term, the T200 flood extent with failed defences and sea level rise. *(T10 and T200 refer to the 1 in 10 year and 1 in 200 year flood events.)*

The present day high flood risk (T10) develops principally from the excessive overtopping at the northern area of promenade (local vulnerability Location A, discussed earlier).

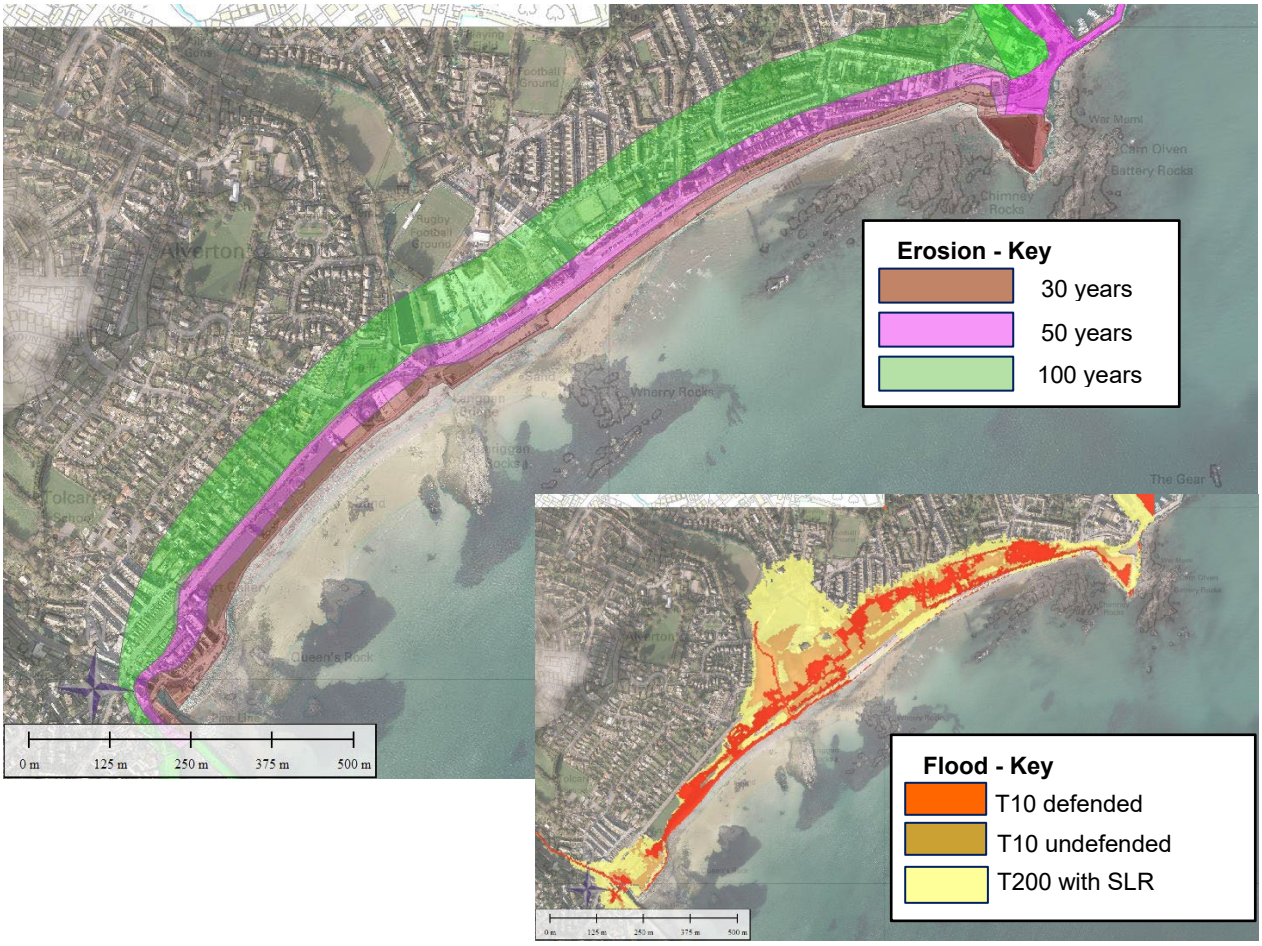


Figure 4-3. Outline of erosion and flood zones under Do Nothing.

Closely associated with this flood and erosion vulnerability along the main Promenade section is that associated with the flood and erosion risk around Newlyn Coombe River. This is shown in Figure 4-3 at the southern end of the Promenade *(highlighted as strategic vulnerability zone (b))*.

The present day flood risk is predominantly due to wave action being focussed into the mouth of the Newlyn Coombe River, with the slightly longer term risk of flooding through to the centre of Newlyn from the river (Newlyn Tidal and Fluvial Assessments -2019). Alongside this is the concern over the condition of defence within the mouth of the river.

It has been assessed that these local defences to the Newlyn Coombe entrance might fail within 5 to 10 years, resulting in immediate loss of property and the loss of access to the Newlyn Harbour North Pier, with the longer term risk to Tolcarne and access between Newlyn and Penzance.

Eastern Green / Longrock to West Marazion (2030 to 2040)
At present, with the exception of defence lengths (defence ref.) 21 and 22, where there is more immediate concern over undermining and deterioration of the existing rock revetment, defences are assessed as having a typical functional life of around 15 years over the main Eastern Green / Longrock frontage. Works have recently been undertaken within a short central section of the frontage (defence ref. 20), providing immediate relief to problems of erosion in this local area to the west of the main car park.

These recent works to defence 20 were designed to prevent erosion back to the main earth embankment and Coast Path, running the whole length of the area. This was the final section where no hard defence was in place. The intent of these works was to safeguard the defences over the next 20 years while the longer term strategy for management was developed. The cost of the works was in the order of £2M.

By year 10, similar works would be required to reinforce defence lengths 21 and 22 but over a longer length, with potential failure of defence lengths 17 to 19 due to loss of the beach occurring potentially by Year 15.

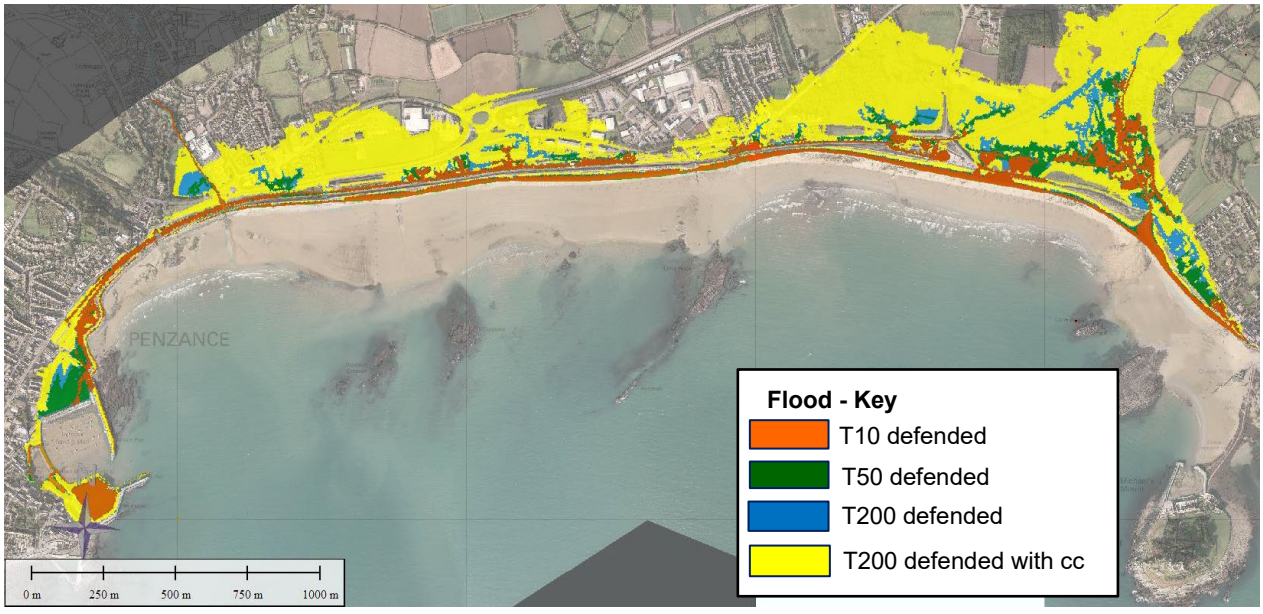


Figure 4-4. Present day flood risk - Eastern Green / Longrock

At present, with defences in place, there is relatively local risk of overtopping flood risk (Figure 4-4). The Figure also shows the longer-term flood risk with climate change (cc) with defences in place.

Failure of defences causes the present day risk to increase substantially. This is shown in Figure 4-5, with frequent major flooding occurring to the main development area, even under a T10 event condition.

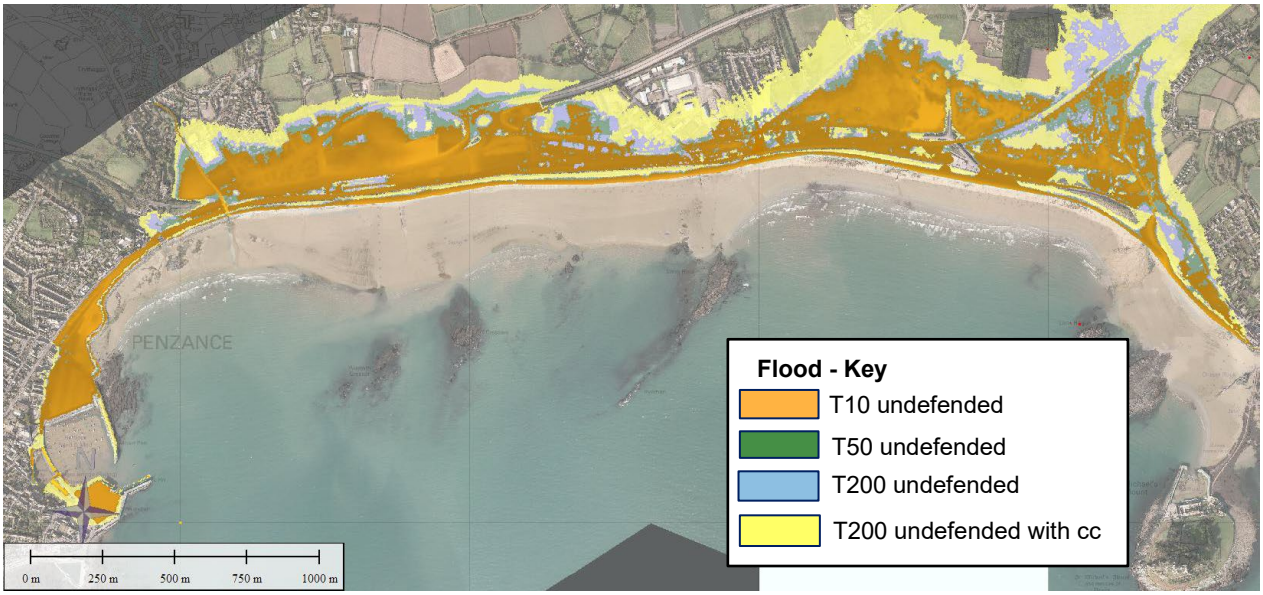


Figure 4-5. Present day and future (with climate change) undefended flood risk - Eastern Green and Longrock

Flood risk would also occur to significant areas of West Marazion (shown in the far right of Figure 4-5), although, as highlighted in Figure 4-1, failure of defences along this area might not occur until years 20 to 30.

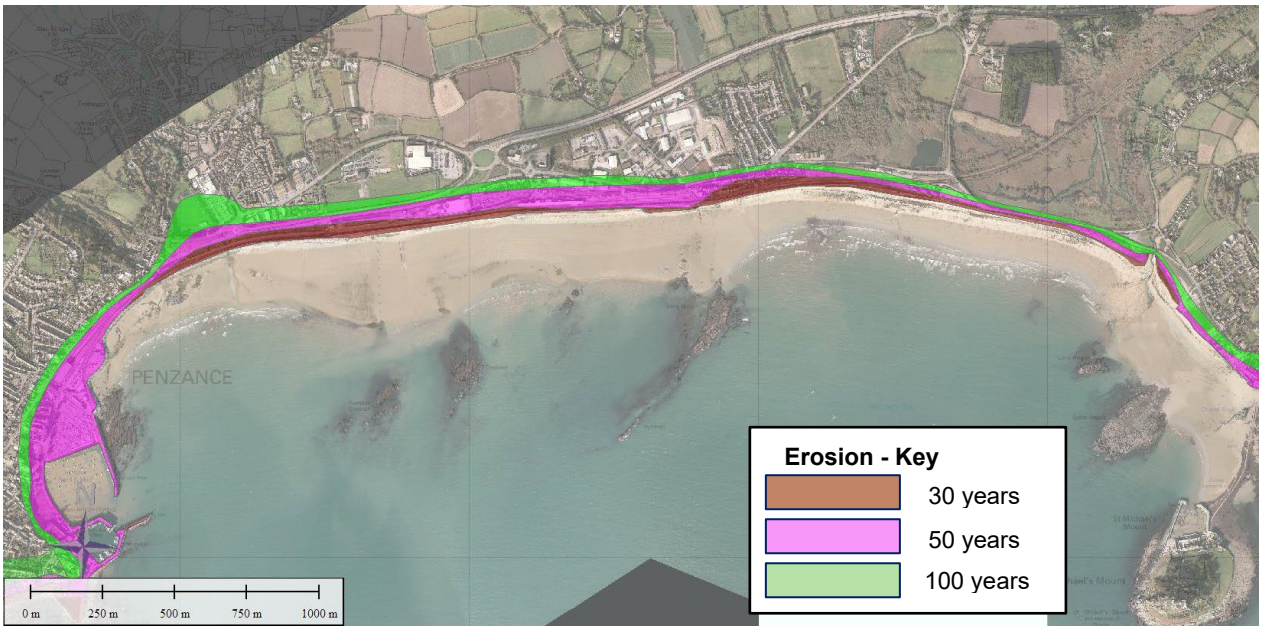


Figure 4-6. Extent of erosion - Eastern Green and Longrock.

With the failure of defences across the wider area, this would allow erosion to happen. The projected erosion lines under a Do Nothing scenario are shown in Figure 4-6.

Erosion will initially develop following failure of the most vulnerable defence lengths at Eastern Green and Longrock over a 30 year period, developing further inland and damaging the railway line and the A30 road over the next 50 years.

Marazion Marsh (2020 to 2040)
Despite some potentially limited additional sediment feeding through to the east from the Eastern Green / Longrock frontage, under this Do Nothing scenario, with sea level rise there would still be significant pressure on the Marazion Dunes and the western part of Marazion. Figure 4-7 shows in more detail the projected erosion zones for Marazion, together with the undefended T10 and T200 flood zones (based on present day water levels).

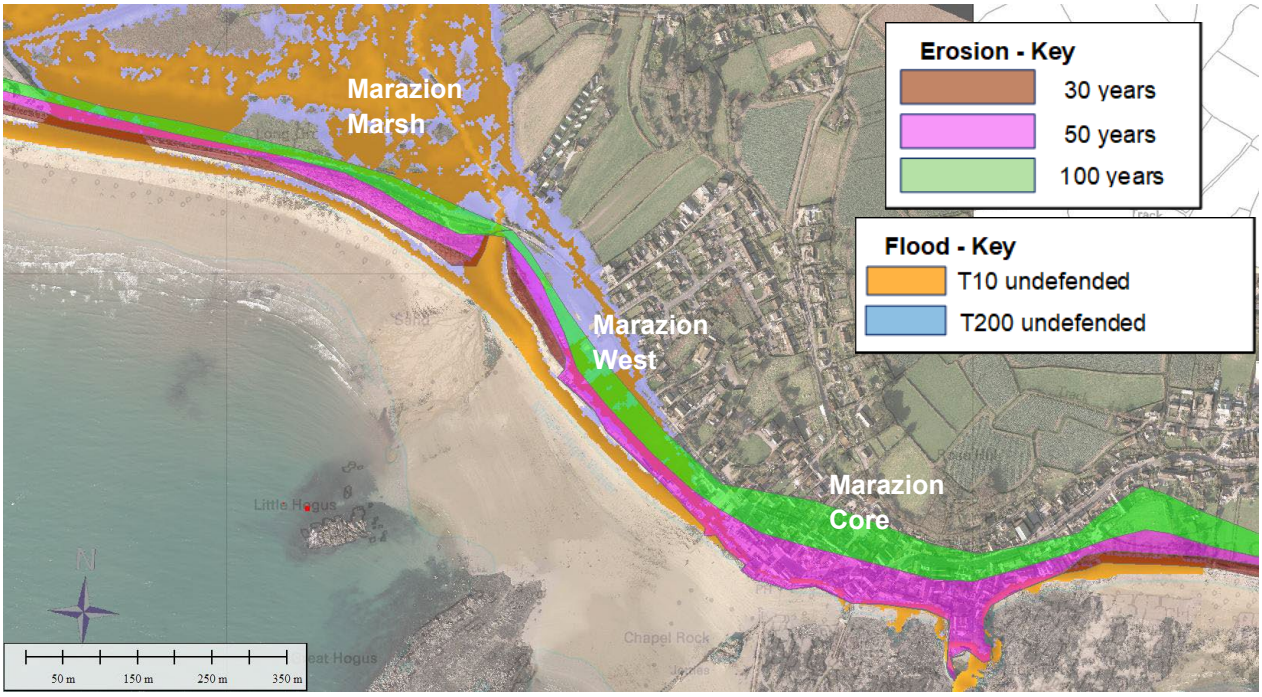


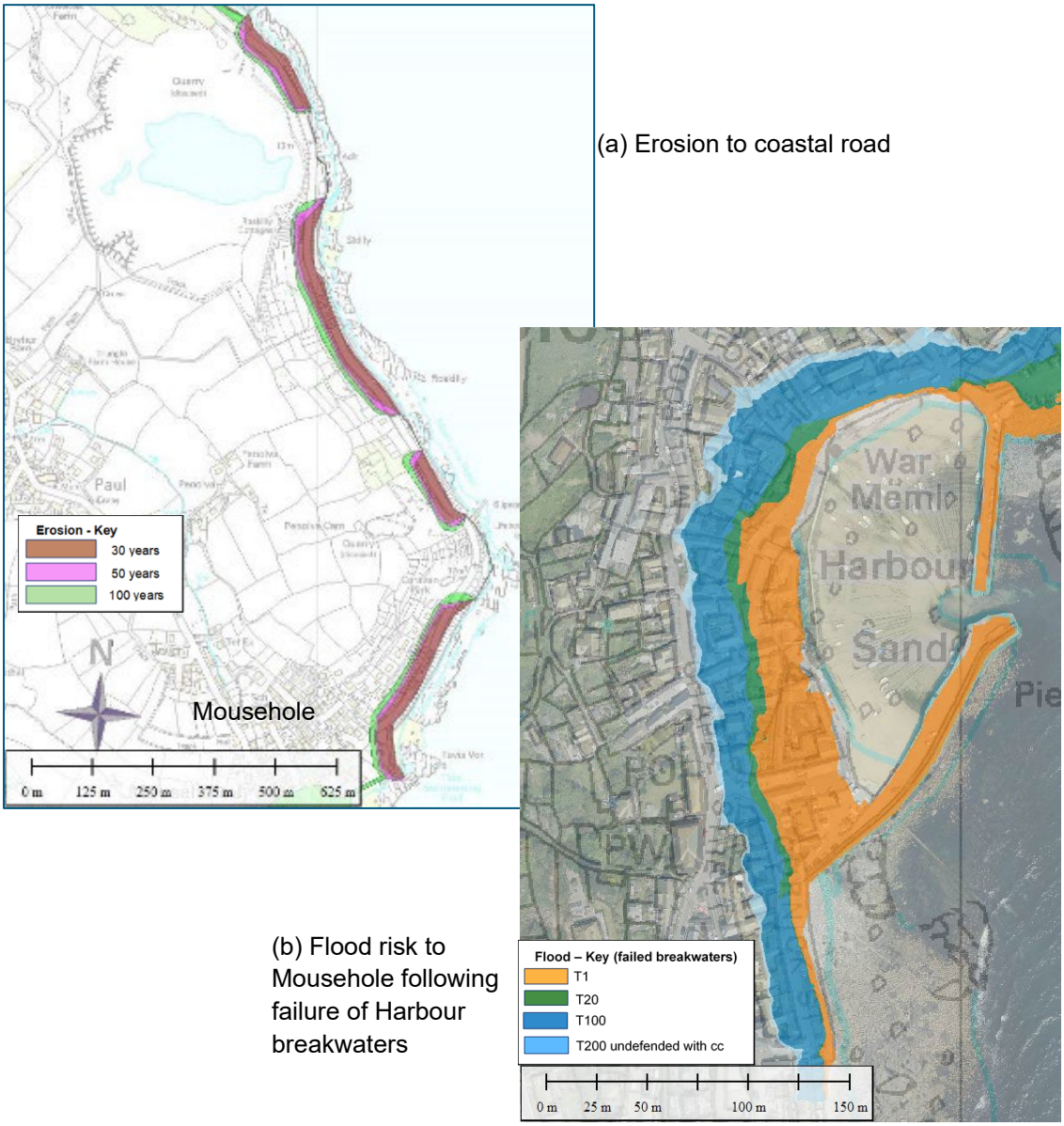
Figure 4-7. Flood and erosion zones for Marazion

Erosion will occur along the dunes to the west of Marazion, with possible failure and loss of the main road within 30 years. The defences to the western part of the Town fail typically in year 20 to 30, with loss of the open space, car park area and seaward properties as well as opening the road and properties further back to increased flooding. The impact on the main core of Marazion is discussed later.

Access to and defences of Mousehole (2035 to 2040)
As shown in Figure 4-1, defences along the road to Mousehole will, without maintenance, potentially become critical in around 15 years' time. Following failure of these defences, both the road and properties associated with communities along the road would be subject to erosion within 20 to 30 years (Figure 4-8a).

Within the Village of Mousehole, the defences to the back of the harbour gain significant protection from the two main Harbour structures. While there would be an on-going risk of flooding to some properties, it is

not until the Harbour structures begin to fail (year 40 to 50) that a more significant erosion and flood risk occurs to the Village (Figure 4-8b)



(a) Erosion to coastal road

(b) Flood risk to Mousehole following failure of Harbour breakwaters

Figure 4-8. (a) Erosion to access road, (b) longer term flood risk to Mousehole

4.1.1.3 Longer term vulnerability (2045 to 2070) – Marazion, Penzance and Newlyn Harbours.

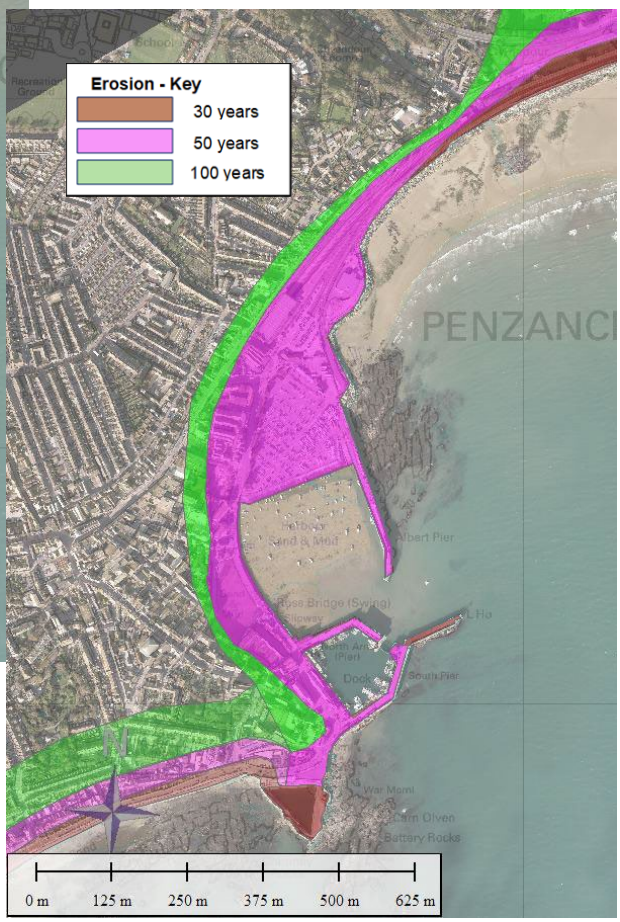
Notwithstanding the losses to the western part of **Marazion**, with loss of access and loss of open space and car park areas, the defences around the core part of the Town are likely to remain in place through to around year 25 to 35. Without maintenance these major retaining structures would start to fail with very rapid initial erosion (Figure 4-7). A large part of the core to the Town would be lost over a 50-year period, with continued erosion of the headland into the future.

At **Penzance Harbour**, while there would be continued flood risk to the central car park and to the railway, which would increase with sea level rise (Figure 4-4), the main longer term risk is associated with the failure of the main Harbour structures.

Typically, defence to the railway line along the Chyandour frontage would fail in around 30 to 40 years, with the main Harbour structures having failed to the extent that they no longer provide protection to the area to the back of the Harbour within 50 years. (This assumes that maintenance is undertaken to the South Pier more immediately.)

In addition to the increased flood risk (Figure 4-9 (a)), there is likely to be increased and rapid erosion of areas within the Harbour (Figure 4-9 (b)), once exposed to the severe wave action in the absence of the main piers. Typically, the shoreline would adapt back to that which existed prior to the development of the Harbour in the mid-1800s, with a degree of further erosion with sea level rise.

(a) Flood risk to Penzance Harbour area following failure of Harbour breakwaters



(b) Projected erosion to the back of Penzance Harbour area following failure of Harbour breakwaters

Figure 4-9. (a) undefended flood risk (2070) and (b) undefended erosion zone (from 2070).

Clearly the coastal change within this area, while assessed as being in the longer term, is closely linked to change impacting on adjacent frontages over a shorter time period.

At **Newlyn**, the situation is quite similar to that of Penzance in relation to the dependency on the two main Harbour structures. As discussed earlier, with respect to the Promenade and Tolcarne area, under this Do Nothing scenario, the defences around the mouth of the Newlyn Coombe River would be lost by Year 10. This would result in loss of access to the North Pier and increased flood risk to the centre of Newlyn, also affecting the main access route (The Strand) to the Harbour. The North Pier would, however, continue to provide wave protection, potentially through to Year 50. Similarly, the South Pier would provide protection over a 50-year period.

Effective use of the Harbour would decrease over the whole time period due to the issues around access to the North Pier and more general access to the Harbour operational area, with more with severe erosion and flooding occurring to the back Harbour from Year 50 (Figure 4-10) as the protection afforded by the main Harbour structures is lost.

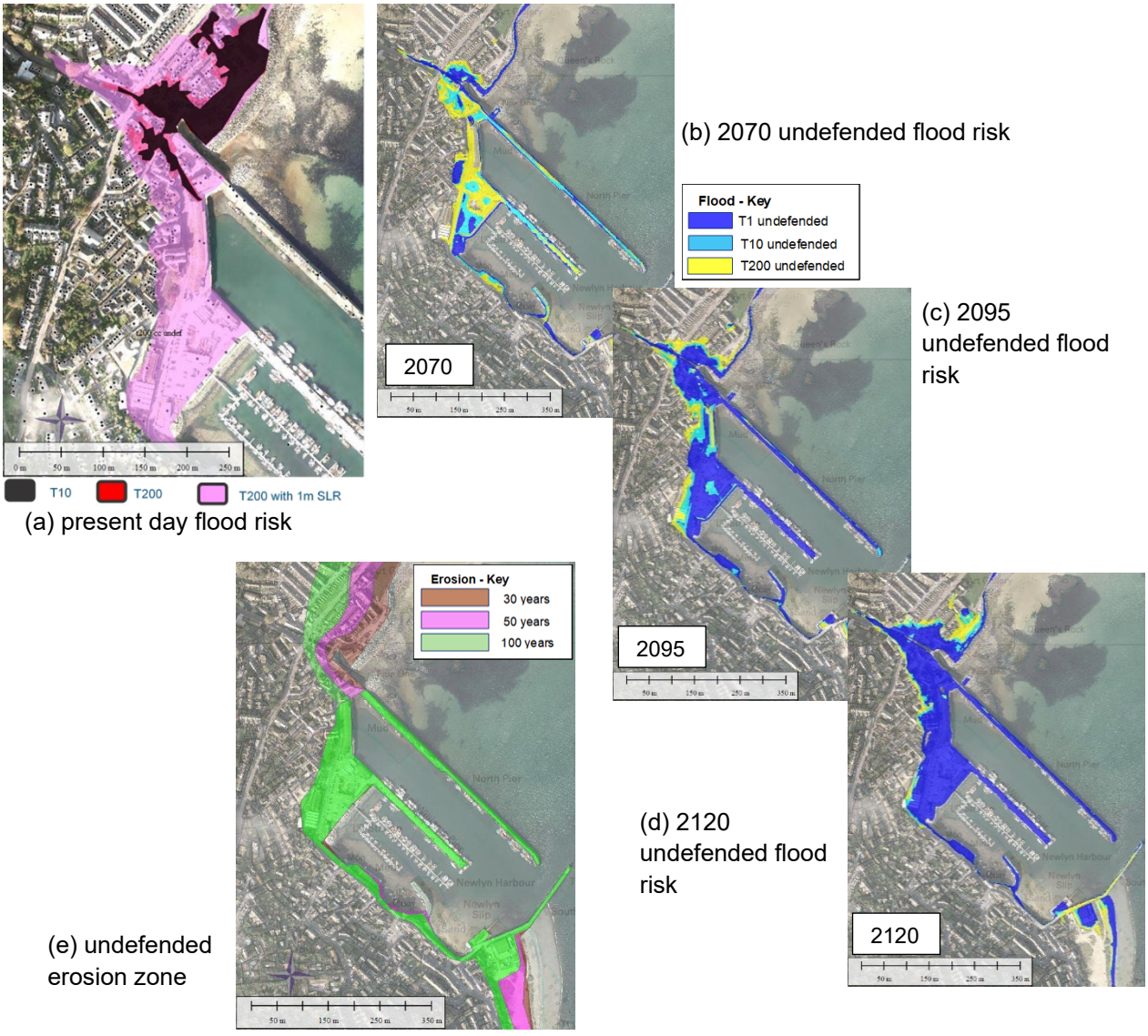


Figure 4-10. Present day and future flood and erosion risk - Newlyn

In addition to the risk to and loss of opportunity for regeneration of Newlyn and Newlyn Harbour, there are strong links to the issues relating to the Promenade, Tolcarne and the main road through to Penzance, as well as the continuity of access via the coastal road through to Mousehole.

4.1.2 Environmental Change and Opportunity

Figure 4-11, maps out a synopsis of the change and significant influence of change on the amenity, natural environment and broader scale strategic interconnectivity of the Strategy area, overtime under the Do Nothing scenario. (A more detailed summary of direct FCERM impacts is provided below in Section 4.1.3).

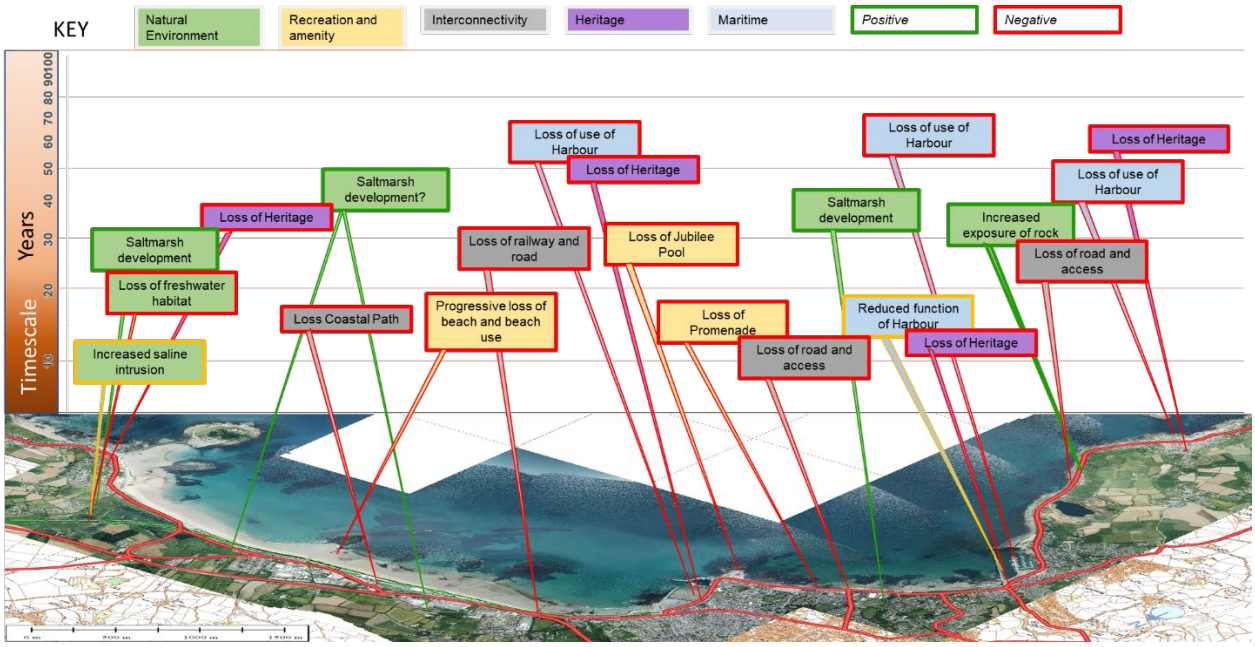


Figure 4-11. Synopsis of influence under Do Nothing

Under the Do Nothing approach there is the longer term potential to re-establish a more naturally functioning coastline, typically over the 30 to 50-year period.

Loss of defence to Marazion would result in significant change to cultural values, alongside impacting on the access to St Michael's Mount with substantial change to use of the area.

No longer taking action to maintain defence to, and within, the Marazion Marsh area has the potential to allow this area to revert to saltmarsh. Removal of the road to Marazion would create space for the landward progression of the dunes. This natural development would be at the expense of losing the freshwater marsh.

As defences begin to fail along the Eastern Green / Longrock frontage, and as regular flooding occurs, there would be the potential for much of this area to develop as naturally functioning saltmarsh, or backshore habitat. Based on the assessment of the coastline prior to defences (Section 3), it seems unlikely that the frontage would develop as a substantial dune system, with the land behind the defences being relatively low lying.

To allow a naturally functioning system within the Eastern Green / Longrock area, there is a need to remove existing coastal infrastructure, removing areas of potential contamination, alongside removal of

the road and railway line. As part of this readjustment, over the shorter term there would be severe reduction in use of the area, initial continued loss of the beach, and loss of both the fixed and active transport network.

In the area of Penzance Harbour, eventual failure of the Harbour structures would allow some further exposure of the rock outcrops, although this would be limited due to the natural rise in the hinterland. Such failure would result in loss of use and cultural heritage of the area, impacting more widely on Penzance, as would the loss of the Promenade, potentially as early as Year 15. This would allow a more naturally functioning shoreline, eventually set back over 100m from the face of the Promenade. This would open up the Lariggan Valley to saline influence, but at significant loss the use of the area.

Eventual failure of the structures to Newlyn Harbour would allow the area to revert to conditions similar to those prior to construction of the Harbour. However, as with Penzance, change would be constrained by the rising land behind. Similarly, allowing defences to fail along the road to Mousehole and to Mousehole itself, would allow natural exposure of the hard rock cliff line but retreat would be constrained by the higher level of the land.

Overall, while allowing the natural development of the coastline could generate some natural environmental benefit in the long-term, it is considered that this would be outweighed by the negative impacts on other aspects of use and values associated with the area. This does not preclude the need for looking at opportunities for adaptation in taking forward a sustainable approach to management.

4.1.3 Summary of FCERM impacts of Do Nothing

The assessment of defence vulnerability is considered in Appendix C and reports identified in Appendix A. While the problem arises as a result of failing defences, the actual problem is in relation to the impact this has. This is summarised below in Table 4-1, highlighting the loss or impact on individual strategic components affecting the broader coherence of the area.

Over and above the significant and progressive increase in flood risk or loss of properties, by 2035 there would be loss of function of the two main harbour areas and the Promenade, with loss of opportunity for regeneration and potential loss of connectivity between Newlyn and Penzance.

By 2050, alongside more general loss or increasing flood risk to property: Marazion would have lost its valued open space, there would be loss of integrity of Marazion Marsh and loss of the Coast Path through to Penzance. The area of Eastern Green and Longrock would be subject to regular flooding, with loss of the Railway line. The use of Penzance Harbour would be compromised and the Promenade area would suffer substantial loss. The core to Newlyn would be affected and the coastal road to Mousehole would be at risk.

By 2070 and beyond; there would be substantial loss of the core of Marazion and Penzance, Newlyn and Mousehole Harbours would cease to function, with increasing loss of properties to both towns and the village to the rear of the Harbours, with further disconnect across the whole area and access through to the wider area to the west. Typically over the 100 year period some 1875 residential properties would be impacted over the whole area.

The initial losses would trigger a lack of confidence and willingness to invest in the area, resulting in less incentive for strategic risk management or regeneration. In effect, in the absence of a co-ordinated approach to management (i.e. the Do Nothing scenario) there would be a failure to deliver either the economic or environmental growth for the area. Table 4-2 sets out the more direct flood risk damages that would occur over the whole area.

Table 4-1. Summary of issues arising from the Do Nothing Scenario.

Time period	Strategic	Local
Present Day (On-going)	***Local flood risk due to excessive overtopping:*** • Disruption of rail service to **Penzance**. • Disruption of road link along **Promenade** and constraint on regeneration. • Flood risk to core part of **Newlyn**, disruption and constraint on use and regeneration of the area and the Harbour.	Property damage behind Promenade and at Newlyn and Tolcarne. Operational constraints to Penzance Harbour.
2021 to 2035 (Imminent)	***Erosion, Failure of defences and increased overtopping:*** • Partial loss of integrity of **Marazion Marsh** SPA. • Initial loss of **Coast Path** and cycle route at Eastern Green. • Increasing disruption to rail service to **Penzance**. • Potential loss of use of Penzance **South Pier**, the **Headland** and **Jubilee Pool**, with impact on Harbour operation, amenity and regeneration. • Initial loss of part **Promenade** and potential loss of access to **Newlyn**. • Loss and disruption to core part of **Newlyn**. • Loss of access to **Newlyn Harbour** and loss of access to North Pier (Loss of Offshore Fishing Fleet). Loss of opportunity for regeneration.	Loss of sewer to east of Marazion Loss of access to properties within the Red River valley. Increased flood risk to A30, railway and to properties to Eastern Green. Increased flooding to businesses to rear of Penzance Harbour. Constrain on use of Penzance central car park. Increased flood damage to properties behind Promenade. Increased erosion and flood risk to properties in Newlyn.
2035 to 2050 (Short term)	***Erosion, Failure of defences and increased overtopping:*** • Initial loss of **Western Marazion** open space and car parks. • Full loss of integrity **of Marazion Marsh** SPA. • Regular closure of main access road to **Marazion**. • Full loss of **Coast Path**. • Loss of **Railway** line due to erosion and increased overtopping. • Major flood risk to **Eastern Green** and **Longrock**. • Substantial flood risk to **Railway** and main **Pumping Station** and to **Car Park** and to use of area. • Impacts on operation of **Penzance Harbour**. • Full loss of **Promenade**, the road and properties to the rear of the road. • Increased flood risk to and effective loss of main seafront property to **Penzance**. • Continued loss of core part of **Newlyn**. • Loss of access to **Mousehole**.	Increasing flood risk to properties in Marazion. Partial loss of Foster Bolitho Gardens with impacts on recreation and amenity. Other losses are considered at a strategic level.
2050 to 2070 (Medium term)	***Erosion, Failure of defences and increased overtopping:*** • Substantial loss of **Western Marazion** open space and car parks. • Loss to core part of **Marazion Town**.	Initial loss of parts of Tolcarne. Loss of property to communities along the coastal road to Mousehole.

	• Loss of **Marazion Pumping Station** • Loss of main road to **Marazion** • Loss of **A30**, commercial and residential properties in **Eastern Green** and **Longrock.** • Physical loss of **Railway Station**, **Pumping Station** and **central car park** • Loss of use of **Penzance Harbour** • Loss of through road to back of **Penzance Harbour** • Continued loss of properties to **Penzance**. • Loss of access between **Newlyn and Penzance** • Loss of **Tolcarne** • Potential failure of **Newlyn Harbour** structures with loss of use of the **Harbour** • Erosion and increased flood risk to **Newlyn** sea front • Loss of **Mousehole Harbour** structures with loss of use of Harbour • Increased erosion and flood risk to **Mousehole**	Loss of properties to south of Mousehole.
2070 to 2120 (Long term)	• Loss of core Town to **Marazion** and through road. • Regular inundation to **Marazion Marsh** • Loss of **Longrock** and **Eastern Green** • Loss of **Penzance Harbour** area, encroaching on properties to the core of **Penzance**. • Continued loss of property to **Penzance** • Full loss of **Newlyn Harbour** and increasing flood risk to the back of Newlyn • Substantial loss of **Mousehole Village**.	

Table 4-2. Summary of Direct Flood and Erosion Risk (100 year) damages under Do Nothing

Area	Direct flood and erosion damages All Properties (100 yr. capped PVd)	Residential		Other damages
		Properties (PVd)	No. Affected	
Marazion	£10.5 M	£6.4M	230	Pumping Station, recreational, amenity and historic value
Eastern Green / Longrock	£103M	£33.6M	395	Railway line and A30, recreational and amenity value
Penzance	£18.1M	£8.1M	408	Railway and Pumping Station, Harbour operation, historic value
Promenade	£41.2M	£22.4	467	Jubilee Pool, transport route, amenity value
Newlyn	£15.1M	£5.9M	173	Harbour operation, historic value
Mousehole	£14.5M	£8.2M	227	Harbour operation, amenity and historic value
Total	**£202.4M**	**£84.6M**	**2025**	

4.2 Current Management – reactive Hold the Line

The SMP recognised the increasing pressure on various lengths of defence, as discussed earlier in Section 3. In anticipation of the development of a more comprehensive overall management strategy, the current approach to management of defences has tended to be a re-active response of maintenance and repair, driven largely by occurrence of damage following storm events. If this response were to be continued (i.e. reactive Hold the Line), then, as indicated in Figure 4-1, there would be a substantial, on-going and increasing need for investment. The need for investment would typically start in around 10 years, with reinforcing and raising defences across the whole area.

While this investment might be needed and might need to be sustained in some areas, in other areas, continued reactive management will increase the separation between the hinterland and its shoreline. In particular, in those areas identified by the SMP (i.e. the Eastern Green / Longrock frontage and the Promenade), further studies (Appendix A and Appendix C) have highlighted potentially significant impacts and diminishing economic justification for this approach to management despite increasing FCERM damages.

As in the Do Nothing scenario (Section 4.1) these issues arise over different timescales but with more general wider consequences on the broader management of the whole area. This imposes a significant and relatively immediate challenge to management as summarised below.

4.2.1 Investment Implication

The problem occurs principally with sea level rise, although obviously this relates also to the on-going deterioration of existing structures. The typical investment profiles for a current management approach are shown in Figure 4-12 by individual defence lengths, summarised by area. These values are taken from a collation of information included within the various reports covered within Appendix C and discussed in more detail with Appendix D.

Under this current management approach there would need to be significant early investment both in the area of Promenade and in relation to the issues associated with the Newlyn Coombe River entrance. More major investment is then envisaged for the Promenade and along the Eastern Green / Longrock frontages between Year 10 and 20. The investment in these two frontages continues to increase at an accumulating rate over the 100 years (Figure 4-12 (b), addressing both the short to medium term risks and increasing steeply due to beach loss and sea level rise.

It is noted that investment within the two main harbour areas tends to be at a slower cumulative rate, with an indication that the need for further investment over the final 20 years might reduce for Newlyn.

Clearly in each of these areas, once reactive management investment has been made in specific individual defence lengths, there is less incentive to change to a more adaptive or resilient planned overall management scheme. In effect, early and then increasing investment in a piece-meal approach tends to trap management into that line of thinking over the longer term. This reduces the capacity for change and promotes an ever more fixed linear approach to management of the shoreline, creating a larger more intrusive barrier between land use and coastal use.

To a degree the same argument applies at the local level, particularly across the Marazion Dunes and lower lying western end of Marazion. In these areas, initially in response to the progressive loss of the dunes, there will be a need to protect the road against potential inundation of Marazion Marsh. Associated with this is the slightly later need to reinforce and raise the defences to the western part of the Town. This

is reflected in the rapidly increasing need for investment in defence well into the future, shown in Figure 4-12 (c).

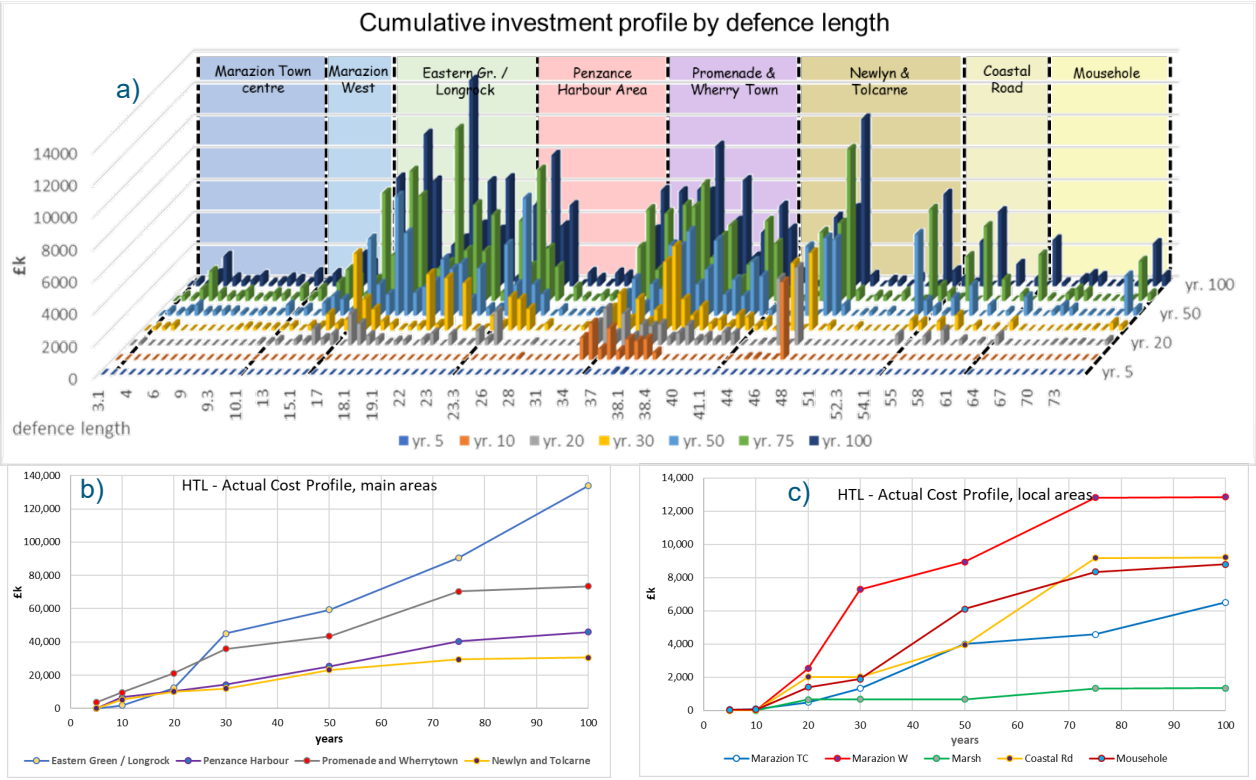


Figure 4-12. Cumulative Investment Profile under reactive HTL.

4.2.2 Broader Environmental Change

As noted above, one of the principal factors in this need for increased and increasing investment is the reduction in beach level and loss of foreshore width.

An analysis undertaken for the Eastern Green / Longrock frontage (Marazion to Penzance LTO Appraisal Phase 2 Report 2019) indicates that, with sea level rise, beach levels in front of the more exposed defences might typically drop (on average) by between 0.2m and 0.8m over the next 25 years, becoming significantly worse over the next 50 years, potentially resulting in a drop in beach level of between 0.4m and 1.8m. This drop in beach levels would extend over the length of the Dune frontage, towards Marazion, but to a lesser degree than over the main Eastern Green / Longrock frontage initially, increasing once the dunes erode back to the hard defence of the road. Similarly, over a slightly longer time, there would be loss of beach width and eventual decrease in beach level as the hard defences constrain beach change to the western part of Marazion.

In all these areas there would eventually be loss of access to the beach, although, under this approach to management it is assumed that the Coast Path would be maintained. Effectively this Coast Path would run to the crest of the defence, acting solely as a coastal route rather than being an integral part of the coastal use. This process is already being seen to occur where reactive defence works have been necessary along the Eastern Green / Longrock frontages.

While already there is a clear disconnect between the use of the Promenade and its shoreline, this would be evermore distinct as defences are progressively reinforced and raised.

Overall, progressive hardening of a defence line across the area would have a major consequence in terms of amenity and landscape, detracting in a significant way from the vison for the coast set out in Cornwall's Environmental Growth Policy.

While this reactive HTL approach might have only minor impact on the various ecologically designated sites (SPA, SSSI and MCZ) across the area, and would, in particular, maintain the integrity of Marazion Marsh, with a decreasing shore level, narrower beaches and loss of dunes, the approach constrains the more natural function of the shoreline, impacting both the amenity use and the seascape.

A synopsis of the influence, overtime, that the current (reactive) approach to management would have on the amenity, natural environment and broader scale strategic interconnectivity of the Strategy area is shown in Figure 4-13.

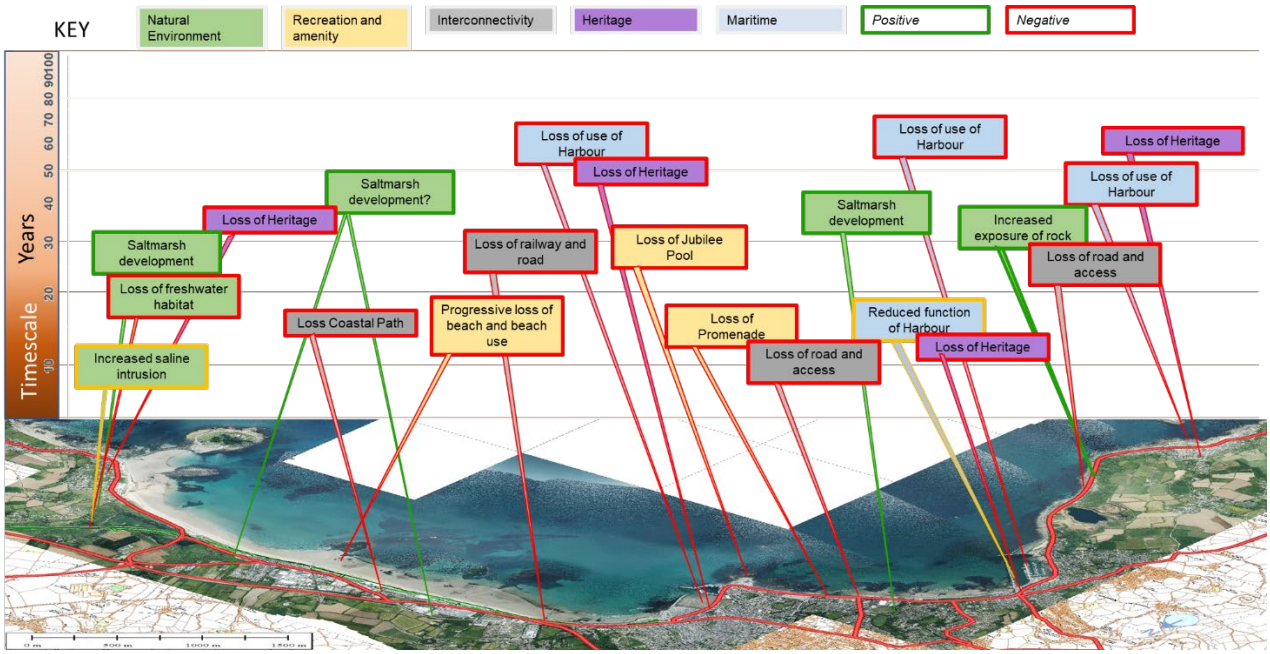


Figure 4-13. Synopsis of influence under Current Management.

4.3 Opportunity

A Do Nothing approach severely constrains the opportunity for regeneration and sustainable economic growth of the area. The current approach to management (as distinct from the SMP policy), being forced along the line of reactive HTL, severely constrains the development of a resilient vibrant community benefiting from better integration with its shoreline.

Opportunities are being considered through the Neighbourhood planning process. However, these rely upon some form of risk management to protect vital aspects of the frontage. There is a real risk, in this, that the vision created by the Neighbourhood Plans would be devalued by an inappropriate approach to defence.

In developing the strategy there is scope for considering different Strategic Management Approaches that open opportunities for change, creating additional benefit for use of the area.

Similarly, in taking these opportunities for different forms of management, there is greater opportunity for creating greater width for natural development of the shoreline, enhancing the sense of place and integrating regeneration with natural growth. Such opportunities may be developed through the overall framework established by a strategic approach (i.e. the Strategy) but also through the Strategy creating opportunity for further development during the implementation of the Strategy.

Figure 4-14, attempts to bring these opportunities to the fore, highlighting critical aspects that have been considered in delivering the strategic objectives and the underlying aims to deliver environmental growth.

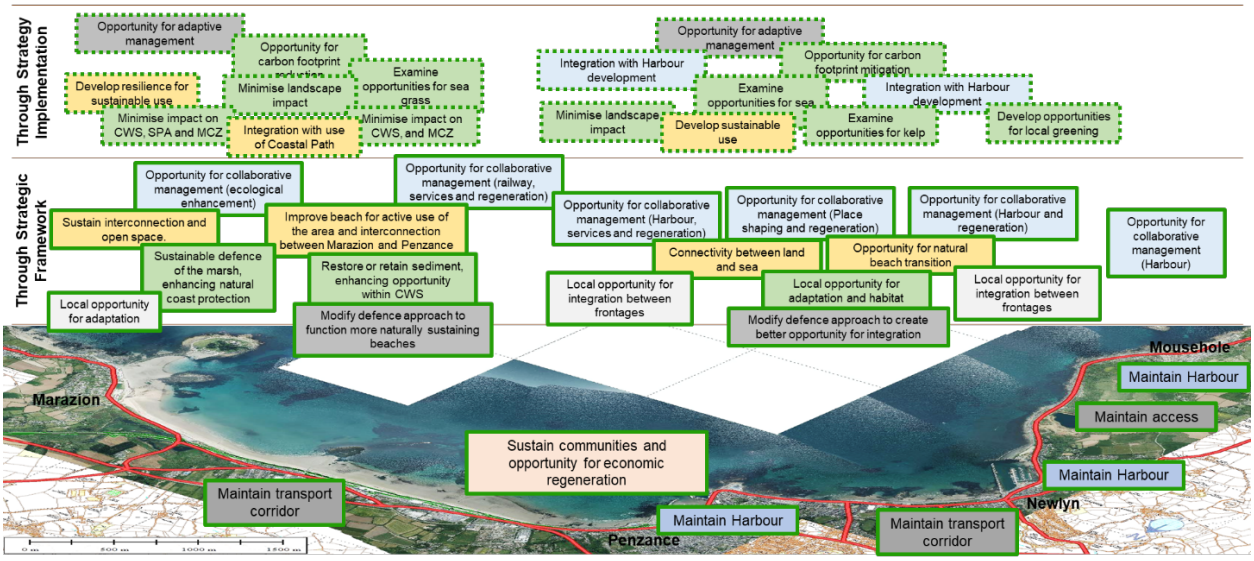


Figure 4-14. Opportunities for sustainable management.

Figure 4-14, highlights the need for change in approach to management, aiming to resolve potential conflicts between different aspects of management (as highlighted above – Sections 4.1 and 4.2, with a focus on a more sustainable integrated approach - Section 2.5), looking at ways in which FCERM management may contribute to the broader vision for the strategy area. In particular, the Figure highlights the potential opportunities for enhancing the natural environment, for collaborative approaches, while still addressing the critical risk to properties, the transport network, regeneration and the Harbours.

It is important to note the distinction between what the Strategy might be able to deliver directly and what the Strategy allows, or enables, to be delivered in the future. Critical to this, is the need, within the Strategy development, to consider how change may be achieved, recognising future uncertainties. As such, the Strategy has had to consider the scope for future adaptation, considering, within each Strategic Management Approach, how options maintain a degree of responsiveness, do not close down opportunity for future change and open up opportunity for further change in the future.

4.4 Need for Change

The current form of risk management is considered important, in a more planned and integrated manner, for some areas. However, in other areas, such an approach is considered to be technically unsustainable in terms of both its long term economic viability and its impact on the values and overall use of the area.

With sea level rise and deteriorating defences, the alternative of abandoning management is similarly unacceptable, with major loss of property and important features at significant risk from coastal change.

This Strategy, being developed in line with the objectives set out in Section 2.4, offers the opportunity to create a more sympathetic resilient form of management, with the potential for environmental growth and sustainable economic regeneration crucial for the area.

Given the interconnectivity across the whole area, this has to be developed in an integrated manner, in partnership with core interest groups and organisations, such as the harbour authorities and service providers, within the context of the planning vison for the area.

One of the critical physical underpinning factors driving coastal change, particularly with climate change and sea level rise, is the lack of capacity for retaining sediment to the foreshore, reflected in the prediction of falling beach levels over certain parts of the frontage. In other areas a critical factor is in sustaining and potentially enhancing the protection afforded by the main harbour defences and hence the need for a supportive partnership approach.

An important aspect of the problem is in setting a sustainable pathway for management now, such that; as in the current management approach, management is not forced down a route that leaves no room for planned adaptation in the future. In this, the strategy has to address inevitable uncertainty in response to future outcomes, such that where decisions on the direction of travel have to be made now, these leave open the opportunity for detailed decision making in the future.

The problem faced by and being addressed by the Strategy is in the recognition that:

- Walking away from management (Do Nothing) would have major economic and social consequences in terms of flood and coastal erosion risk, severely constraining opportunity for essential regeneration of the area.
- That maintaining and reinforcing existing defences in every area, across the whole frontage would drive management in an unsustainable direction over the longer term, with increasing negative impacts on the natural environment and the use and connectivity between land and sea, failing to meet the objectives for environmental growth and constraining the development of the sense of place.

Associated with this is the need for a truly integrated approach to management, developing the opportunity for partnership both in terms of funding and in terms of delivering the broader vision of Place in a sustainable manner.

5 Development of Strategic Management Approach Options

A range of Strategic Management Approaches for the whole area has been built from the more detailed assessment of local options undertaken for individual sections of the coast. In each local area a full long list of options were considered (Appendices C1 (Marazion), C2 (Penzance), C3 (Newlyn) and C4 (Mousehole) and Newlyn Coombe (Mott Macdonald 2019), Penzance Promenade (Mott Macdonald 2017) and the Longrock/ Eastern Green frontage (RHDHV 2019) as detailed in Appendix A), with, in each case, these being filtered down to a viable local short list being carried forward to the Strategy.

In some areas there are interdependencies between local short list options in one area when being considered in relation to management of adjacent frontages. It is also recognised in development of these short list options that there remains some uncertainty or dependencies over timing as to how these local short list options may be combined over the whole area. This is together with a recognition that, while the Strategy aims to define a clear direction of travel (an agreed Strategic Management Approach), there may need to be further discussion in detail over certain local short list options in specific areas as the Strategy is implemented over time.

5.1 Discussion of local short list options.

The aim of previous work (reported in detail in Appendix C) has been to bring the assessment of options up to a consistent level of detail across the whole strategy area. The results of this are summarised below, with a brief explanation of how different local short list options might deliver different outcomes and how, between areas, different options may interact.

5.1.1 Marazion

Overall approach.

As highlighted in previous sections of this Strategy document there are quite distinct sections of shoreline covering the Marazion frontage, each presenting different issue for management.

Over the core part of the Marazion Town, properties and features essential to the overall character of the Town have been protected over a long period of time, being protected by high, generally masonry walls. These defences include the area of the small harbour at Top Tieb.

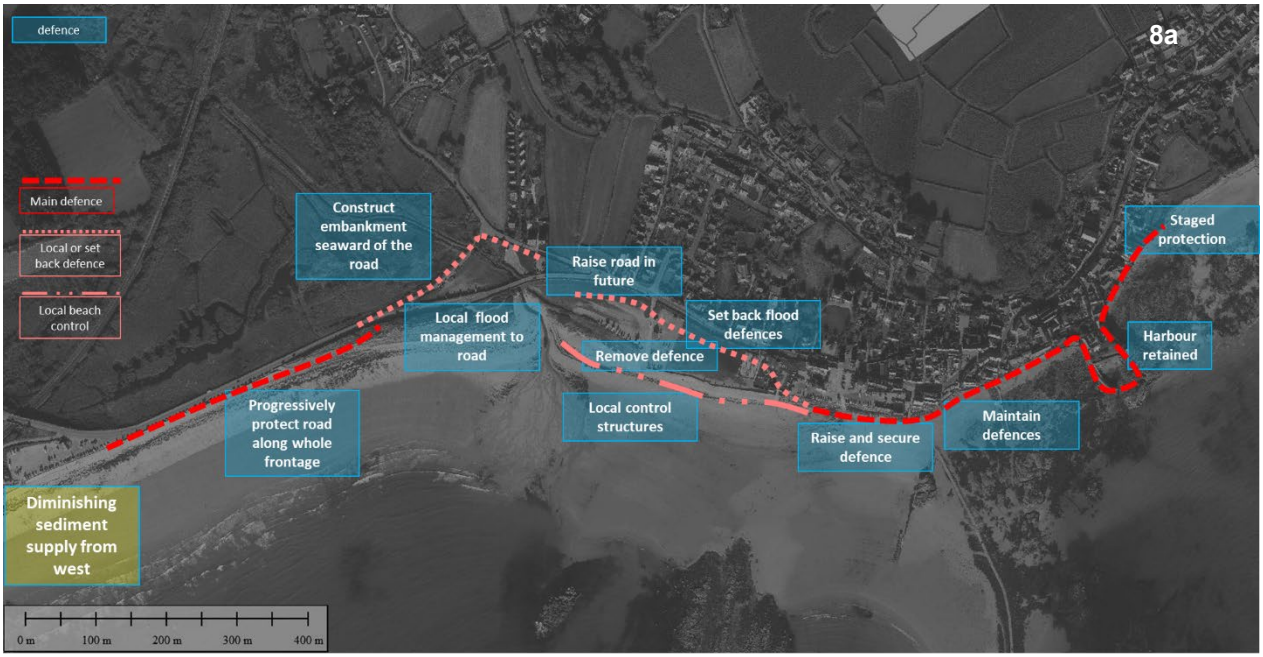
These defences to the core part of the Town are constructed to natural rock, with little scope for realignment and little scope for alternative forms of management beyond local sub-options of reinforcing the toe with rock or maintaining the walls and raising them. This might need to be balanced with the need to introduce local property level reliance measures as the risk of overtopping increases with sea level rise. These different approaches all have a similar long term cost of around £6M (100 year actual cost) with a good justification for continued management. Therefore, within each of the short list options for the Marazion Area brought forward to the Strategy, it is assumed that the core part of the Town would continue to be defended. Major works would typically not be required until Year 25 to 35, at which point a decision might be made as how best to manage these defences in detail.

The interface between these Core Town defences and the natural eroding cliffs to the east, depends critically on the risk to the main sewer and, in the longer term, risk of outflanking and protection to the road and property set back on the coastal slope. Various options to address these risks are discussed in Appendix C1 and these are picked up later in developing the implementation of the broader Strategy. However, in terms of the broader development of the overall Strategy, at this stage, these decisions are considered to be of a local nature.

The western part of the Town is in many ways more complex, relating both to the long term management of Marazion Dunes and Marazion Marsh and also linked to management of the Longrock frontage, particularly in relation to whether there would be additional sediment supply feeding the Marazion area from the west.

Alongside the baseline (Do Nothing) option, considered overall for all areas, potential local options for Marazion have been considered under the two scenarios of "with **no** additional sediment supply" and "with additional sediment supply".

The local assessment concluded that, with no additional sediment supply, this would result in increased erosion across the area and lead to the progressive loss of the Dunes. This would create a need for a significant set-back of defences over the western part of the Town and set back of defence along the eastern part of the dunes (Figure 5-1. Local Option 8a).



OPTION 8a **Local setback of defences.** (No additional sediment supply from west)

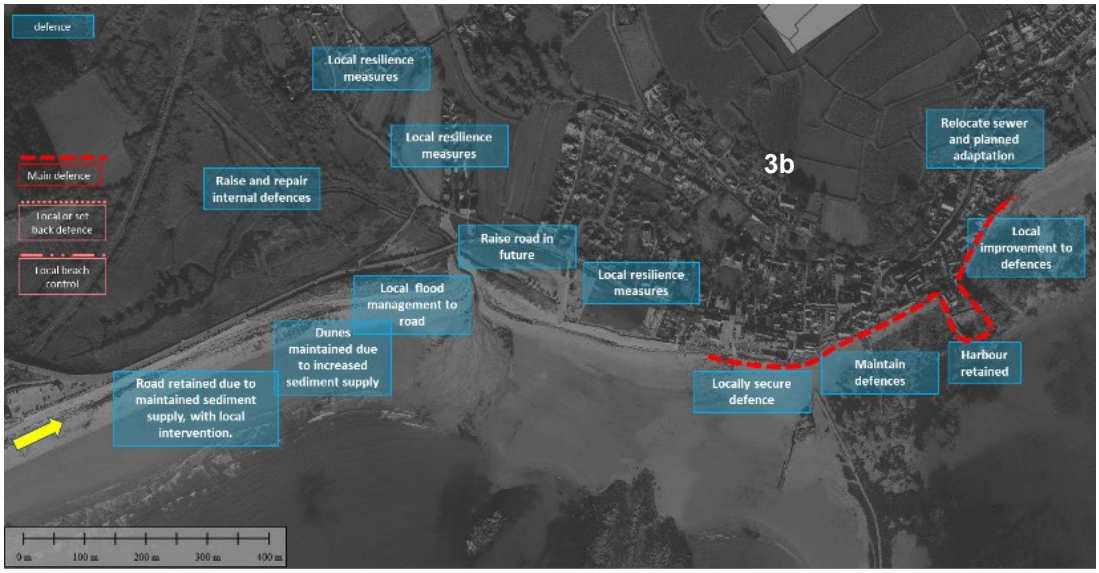
Figure 5-1. Marazion outline approach to set back (local option 8a)

Following a period when existing defences are maintained, major setback works would occur, starting at around Year 35, with the need for some additional defence to the road behind the dunes occurring more typically by Year 10 to 15. Other options were considered but it was concluded that under this scenario (no additional sediment), the above option was the only one viable into the future, as discussed in Appendix C1.

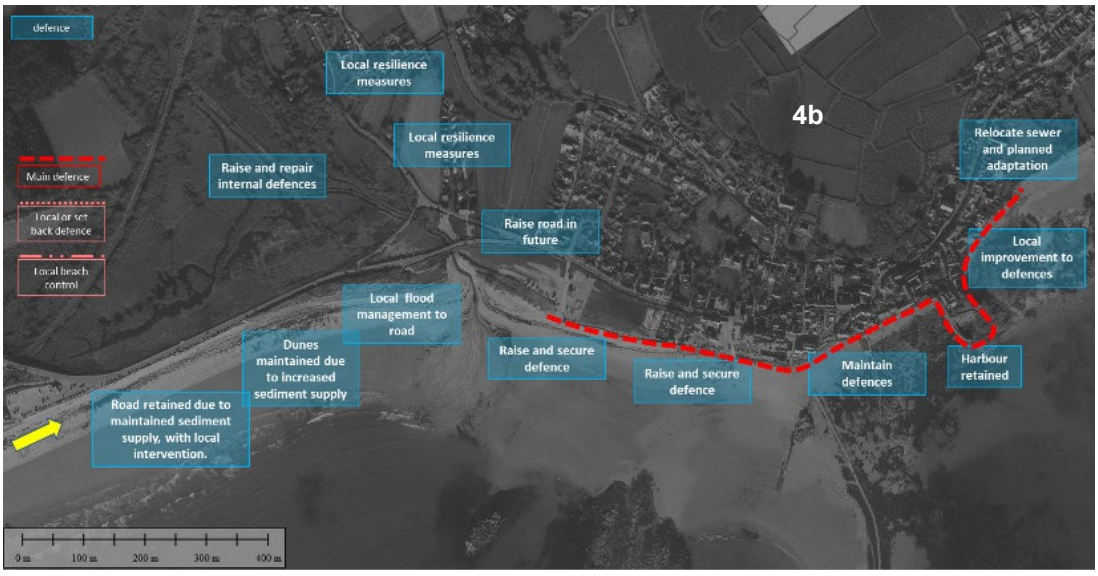
An increased sediment supply, as a result of possible management to the frontages to the west, would open up a different range of options in relation to this western part of Marazion. In outline, these might range from the option to allow the natural response of the shoreline over the western area, accepting the loss of the open space and car parks (Local Option 3b), through to sustaining the existing defence line over the whole area (Local Option 4b) as outlined in Figure 5-2.

In both options, works would be required within the Marsh to raise defences against saline intrusion, with the need for property level resilience measures within the Red River valley and, under Option 3b, to properties within Marazion.

The two options effectively bracket the approach to management: Option 3b allowing natural response and Option 4b constraining the natural response, with the need for higher more robust defences and the potential for lower beach levels in front of the open ground to the western end of Marazion.



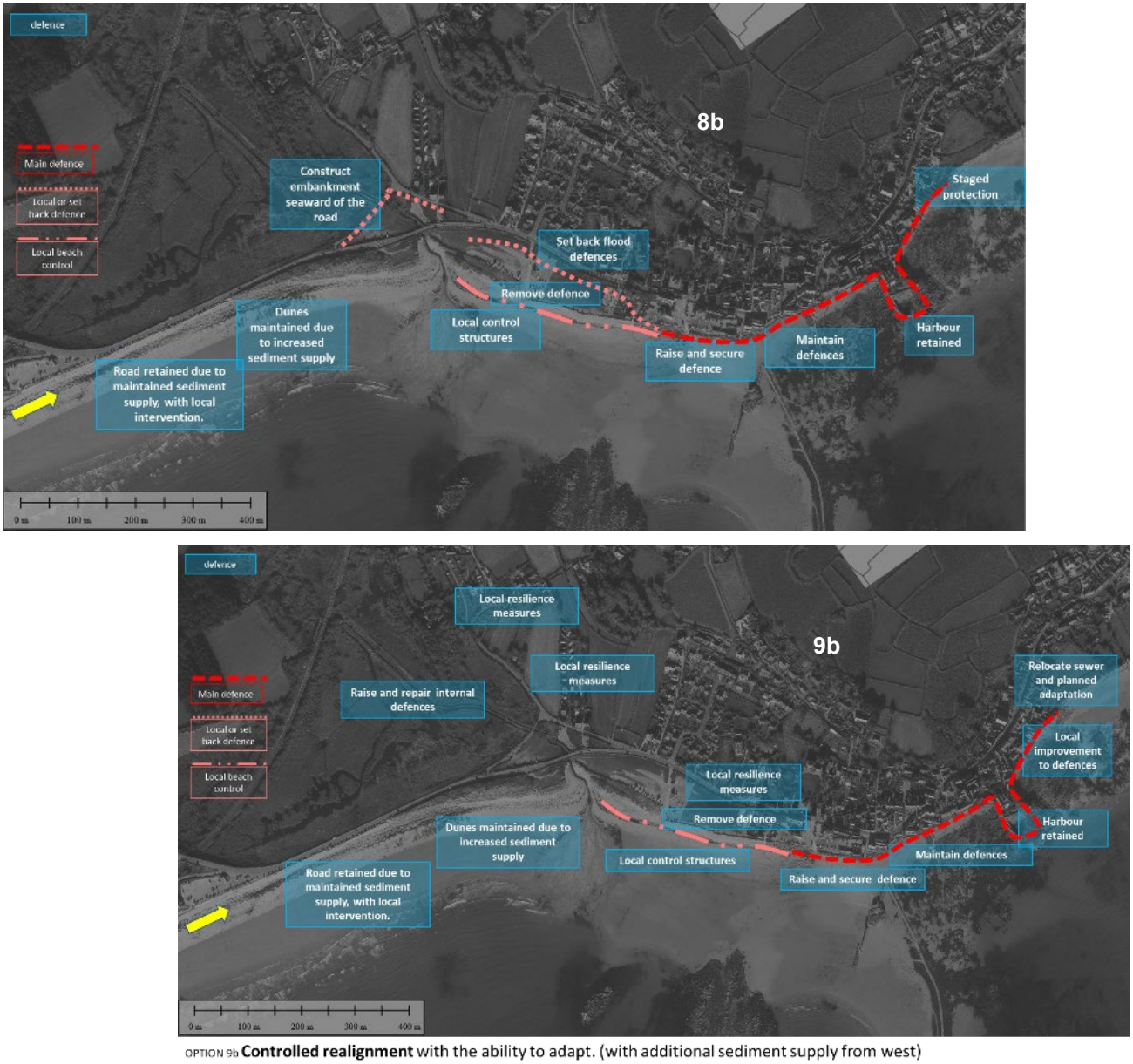
OPTION 3b **Sustain core function of Town** Adapt in other areas. (With additional sediment supply from the west)



OPTION 4b **Sustain existing defence line.** (With additional sediment supply from the west)

Figure 5-2. Marazion outline options 3b, allow natural response, and 4b, sustain existing defence.

Offering a potential alternative(s), the local study identifies two further options aimed at managing defence in different ways (Figure 5-3. Option 8b – local set back, and Option 9b – controlled realignment).



OPTION 9b **Controlled realignment** with the ability to adapt. (with additional sediment supply from west)

Figure 5-3. Marazion outline options 8b, local set back, and 9b, controlled realignment.

Under both these alternatives the defences to the western end of Marazion would eventually be removed allowing a more natural development of the foreshore. The key difference between these options would be in relation to how the impacts of that develop are then managed. In the case of Option 8b, the aim would be to provide a setback defence to the area of the Marsh, rather than raise defences internally along the sides of the Red River. Under both options the emphasis is on allowing a more naturally functioning shoreline but still controlling how this develops.

Within this context, there may be scope to develop or modify either Option 8b or 9b, combining the approaches in different ways to allow integrated adaptation of use of the open space. As in the case of Option 8a (with no additional sediment) the typical time period of when decisions with respect to major change might need to have been made is in the order of 35 years' time. Therefore, within the Strategy the

decision over how these two options might be developed in detail can be deferred. However, the basic principle that, under either of these options, there would be the intent to allow the coast to adjust more naturally, is taken forward into the broader assessment undertaken in developing possible Strategic Management Approaches.

Local Management Approach Options considered in relation to the broader Strategy

The various local short list options outlined above (and set out in detail in Appendix C1) for management of the Marazion area have been taken forward into the assessment of the overall Strategic Management Approach options considered in developing the Strategy. In summary:

- The local Do Nothing Option is taken forward as part of the baseline Do Nothing Approach for the whole strategy area.
- In addition to this, the local assessment identifies that, with no additional sediment being provided from the west, there would be a need to accept realignment of the western end of Marazion in the future with the need to protect the road and construct set back defences;
    - Option 8a - Realignment.
- With additional sediment supplied from the west, there are three fundamentally different local options:
    - Option 3b – Allow natural response
    - Option 4b – Sustain existing defences
    - Option 8b/9b – Controlled realignment (with or without set back defence – (deferring the detailed decision as to how in detail this realignment would be delivered).

The critical interaction between this frontage is in relation to the potential sediment supply as a result of the preferred management option for the Eastern Green / Longrock frontage.

The Do Minimum option was considered in the detailed local assessment, with the conclusion that this only provided a short term delay of Do Nothing and was not considered to be a standalone Strategic Management Approach. An element of Do Minimum is, however, considered within the above options, delaying the need for major works and capitalising on the performance of the existing defences.

5.1.2 Eastern Green / Longrock

Overall approach.

The initial concepts for management were developed through the Mounts Bay Strategic Assessment of Adaptive Frontages (RHDHV 2015). These outline options were developed further through detailed modelling in the Marazion West to Penzance Long Term Options Appraisal (RHDHV 2019).

Options considered included Do Nothing, Do Minimum and sustaining current management (linear Hold the Line), alongside three different options for imposing stronger control of the foreshore. The final option brought forward is that of a Sand Scaping (sand engine) approach. These options are discussed below.

As discussed in Section 4.2 (Figure 4-11), continuing management of existing defences under current practice, incurs the need for increasing and continuing investment along the whole frontage, with the significant disbenefit of reducing beach levels into the future. Notwithstanding this, purely from a flood and erosion risk management perspective this option (local Option3 as set out in RHDHV 2019) remains viable, although this would not be in line with the recommendations from the SMP for a more adaptive approach (i.e. for managed realignment in epochs 2 and 3).

In considering alternatives to local Option 3 (linear defence)), three basic variations for improving defences (local Option 4 as set out in RHDHV 2019)) were considered making use of breakwater / fishtail structures to reinforce the basic defence function while addressing the longer term fundamental loss of the

foreshore (in effect realigning the approach to management in line with the SMP, addressing the concerns raised by the SMP).

These three options are shown in Figure 5-4.

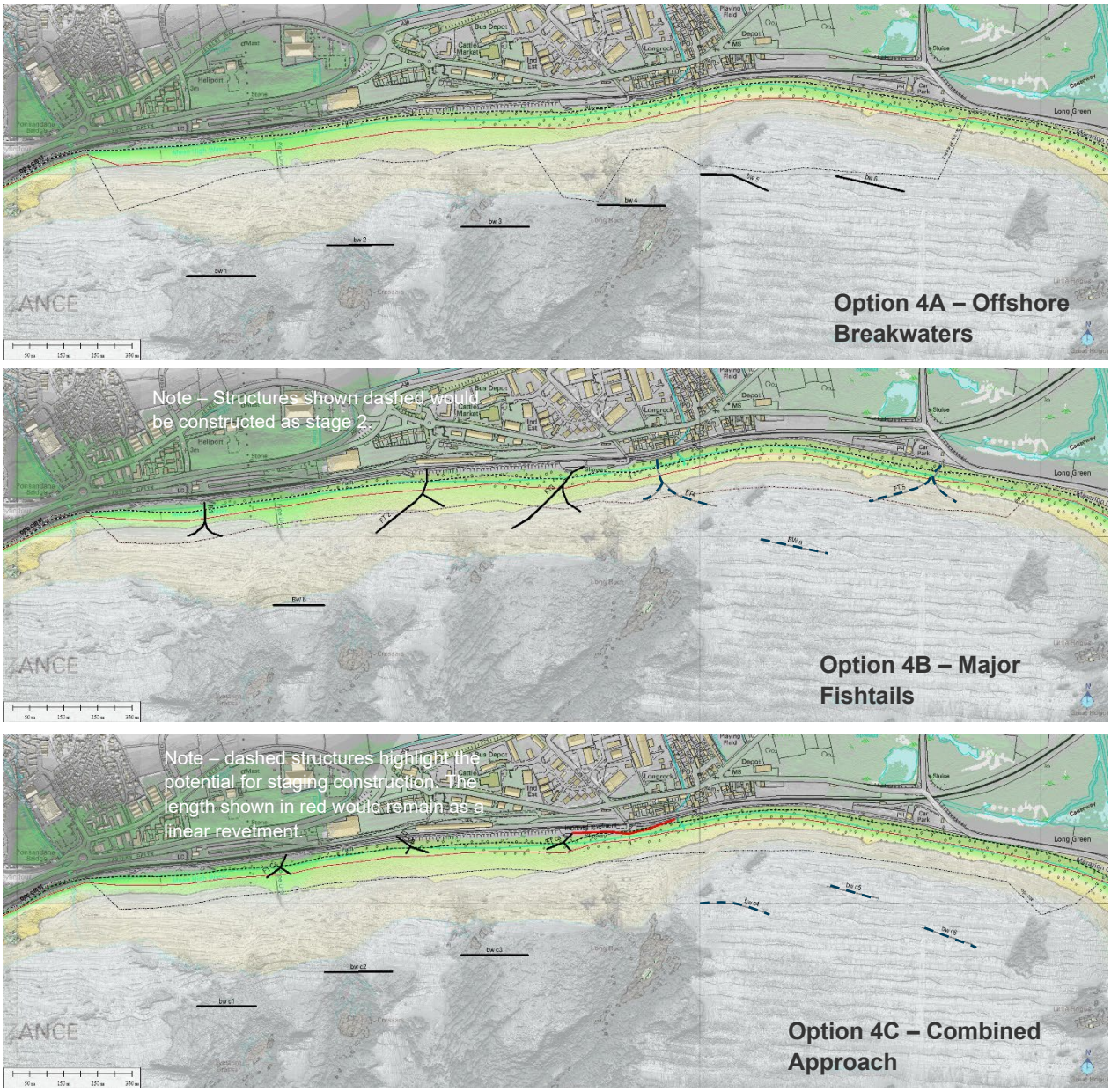


Figure 5-4. Options for shoreline control.

Option (4A) offers little scope for phasing works due to the degree to which breakwater by themselves tend to draw sediment into the lee of the structures. Typically works would be required within 15 years. Despite the need for recharge, there is the need to construct all breakwaters together to avoid loss of beach between breakwaters. Typically, there would be a need to renourish the beach every 10 years to maintain the necessary standard of protection across the whole area. This significantly adds to both the initial cost and the longer term discounted cost (Figure 5-5).

For these reasons, the basic breakwater approach (Option 4A) was dismissed.

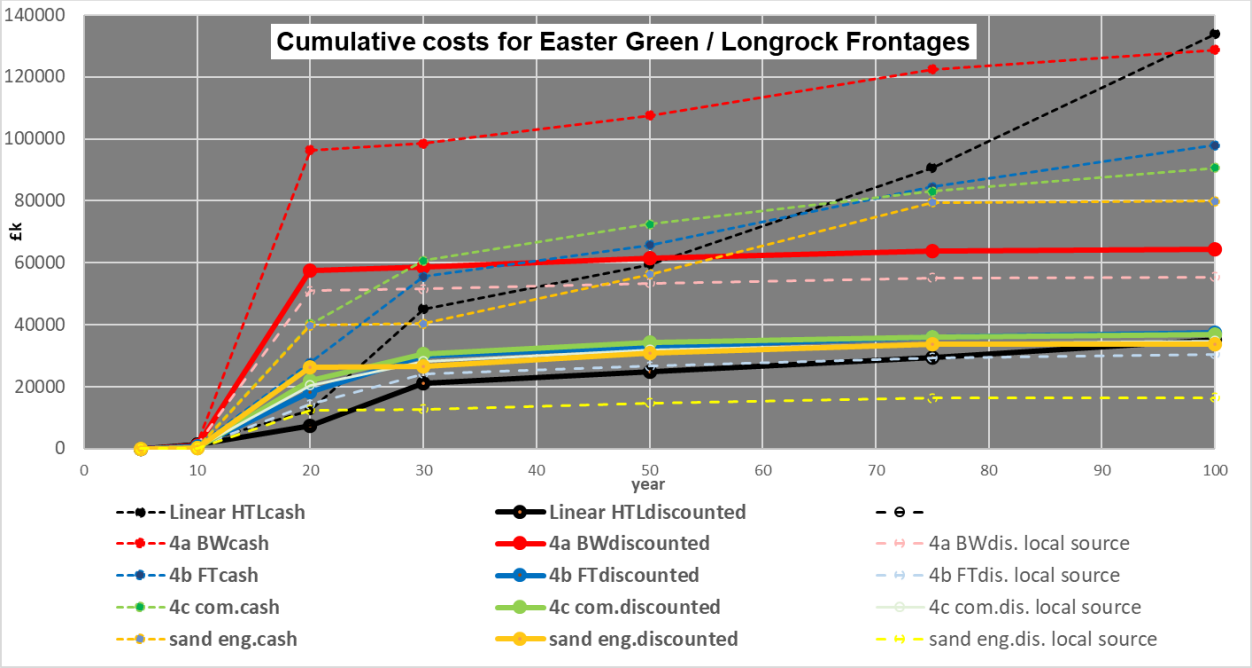


Figure 5-5. Outline cost profiles of Options for Eastern Green / Longrock.

Options (4B) and (4C) both allow different timescales for intervention to be introduced. Option (4B) achieves this through the use of major shore linked structures (fishtails), addressing the more immediate concerns relating to the Eastern Green section by Year 12, with additional structures being constructed by Year 25, addressing the slightly longer term vulnerability associated with the eastern Longrock section. This timing or phasing of works is replicated in Option (4C). However, in the case of Option(4C) a hybrid approach is taken, introducing a combination of breakwaters and shorter fishtails.

In Option (4C), the existing rock revetment in the area of the central car park (defence length 19 and 19.1) would be reinforced as highlighted in red in Figure 5-4, protecting this local area and allowing a more efficient configuration of the nearshore structures.

These options provide a significantly different approach to management, compared to that of a linear defence, restoring the width of the beach, relieving pressure on the existing defence line and maintaining, both visually and in the terms of use, the interconnection between the foreshore and the backshore. However, the shoreline would be divided into more discrete sections by the structures, creating a different visual impact.

Modelling has demonstrated that sediment would be retained in front of the existing defences. However, in order to provide an appropriate standard of defence this does require a significant initial sediment recharge, with on-going regular renourishment required; every 15 to 20 years over the western part of the frontage and every 10 years over the eastern end. The trigger for renourishment over the western section is strongly linked to when the beach line reaches a “critical trigger crest width” with respect to individual defence lengths (see box below).

Over the eastern frontage, this also takes into account the additional sediment required to sustain a minimum sediment supply to the Marazion area.

Trigger crest width for re-nourishment
The trigger crest width for re-nourishment is 25 metres. This trigger crest width is a combination of the storm buffer width of 5 metres and 20 metres necessary to provide protection against overtopping. This trigger width is applied across the whole frontage, providing a conservative width in some areas offering a protection standard well in excess of the T200 level.

The same critical trigger width has been used in examining the approach to more major sediment recharge (Figure 5-6 – local Option SS, Sand Scaping), without control structures.

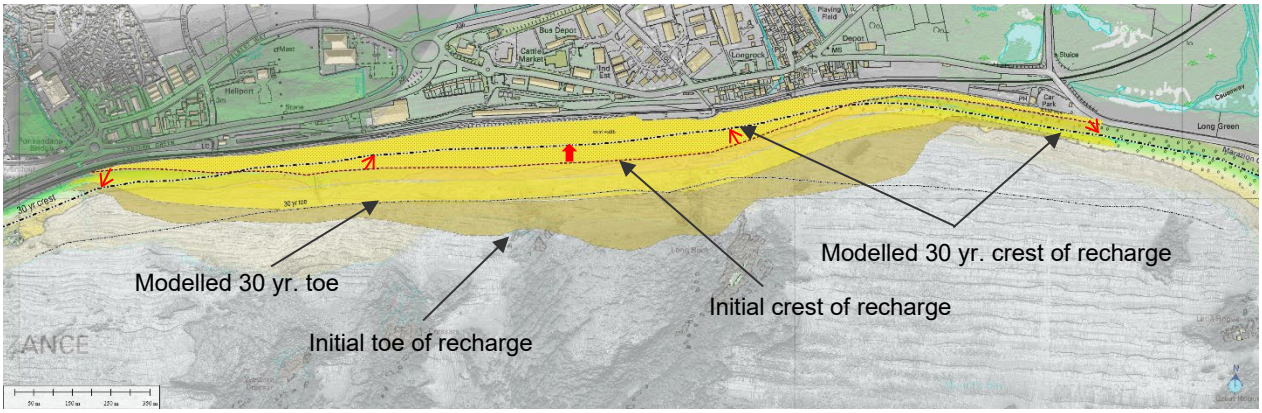


Figure 5-6. Option SS - Sand Scaping

In contrast to options discussed above, Option SS – Sand Scaping offers the alternative opportunity to provide a more natural approach to management of the whole frontage as a complete unit, with the specific intent to allow natural distribution of sediment over the wider area. Modelling indicates that there would be the need for an initial recharge of 1.3 million m^3, focussed on the core of the frontage to achieve the required standard of protection over a period of between 35 to 40 years.

Subsequent renourishment would be in the order of 0.5 million m^3 (undertaken in Year 35 to 40), potentially increasing to around 0.75 million m^3 over the longer term (Year 70). With sea level rise there is the potential need to raise the crest of certain critical defences lengths over that longer term time scale. These additional costs are included in the cost profile assessment shown in Figure 5-5.

Examining these local options (Marazion West to Penzance Long Term Options Appraisal (RHDHV 2019)) presents three fundamentally different local approaches (i.e. over the Eastern Green / Longrock area), which are taken forward, in combination with other local options for adjacent areas, in developing the potential overall Strategic Management Approaches for the whole area.

In considering this, Option (4A) is ruled out due to very high initial costs.

Local Management Approach Options considered in relation to the broader Strategy
The various local short list options outlined above (and set out in detail in RHDHV 2019) for management of the Eastern Green / Longrock frontage have been taken forward into the assessment of the overall Strategic Management Approach options considered in developing the Strategy.

In summary:

- The local Do Nothing Option is taken forward as part of the baseline Do Nothing Approach for the whole strategy area.

Notwithstanding the local conclusion with the preferred option for Sand Scaping, three strategic options are taken forward to the overall Strategy assessment:

- Local Option 3, - sustaining the existing approach to responsive linear Hold the Line (accepting a reduction of sediment to adjacent frontages).
- Local Option 4 (B / C), - recharging the frontage with sediment, dividing the frontage into distinct compartments and limiting sediment movement (while maintaining a minimum sediment supply to the Marazion area).
- Local Option SS, - constructing a 1.3 million m^3 sand engine across the whole frontage (reintroducing sediment supply to the wider coastal system, both east and west).

In taking these local options forward to the development of the overall Strategy, certain critical aspects are highlighted:

Sediment supply.

- Option 3 (linear defence) offers no additional sediment to the system. In fact, sediment supply to the east (to Marazion) would reduce, limiting the options for management in the Marazion area as discussed in Sub-Section 5.1.1 above.
- Option 4 (B/C) maintains a minimum compensatory level of sediment supply to the Marazion area, this does not fully address the longer term loss of the Marazion Dunes.
- Option SS provides additional protection both to the Marazion area, improving the beach condition across this area, alongside reducing exposure of the defences at the eastern end of the Penzance Harbour frontage.

Integration of management.

- Option 3 maintains continuity of the existing defence line through the Penzance Harbour area, but limits the opportunity for integration with any change in management approach within the Chyandour area.
- Option 4 (B/C) offers opportunity for integration with alternative forms of management to the Chyandour area.
- Option SS, in addition to the wider range of options for management of the Marazion area, provides additional sediment to the Chyandour frontage, potentially supporting alternative forms of defence to the area.

Use and appearance of the Eastern Green / Longrock frontage.

- Option 3 will perpetuate the loss of beach width limiting use and interconnection between use the beach and the hinterland use, while also impacting severely on the visual appearance of the area.
- Option 4 (B/C) would create more localised areas of wider beach, while sustaining a basic beach width across the whole frontage. The option would change the visual appearance of the area, with loss of the large-scale extensive curving south-west facing bay to one of more locally controlled smaller embayments.
- Option SS provides the opportunity to create an important area of upper beach, contributing more broadly to the opportunities of coastal use within the larger area, while also maintaining the appearance of a large scale open frontage.

Natural environment

- Option 3 would result in loss of upper beach width, with the potential to increase wave reflection and increasingly fixing the back beach, with potential for coastal squeeze impacting over the lower foreshore.
- Option 4 (B/C) introduces the opportunity for local areas of dune growth, softening the impact of coastal squeeze and sustaining the development of the lower foreshore but with the potential need to construct structures impacting on the existing rock outcrops.
- Option SS does create significant foreshore width alongside restoring and safeguarding the extent and function of Marazion Dune. However, associated with this is the potential impact of the toe of the sand engine on the lower foreshore rock outcrops.

These issues have been considered further in the local study and will need to be considered in assessing the impact of strategic approaches within the full development of the Strategy.

The Do Minimum option was considered in the detailed local assessment, with the conclusion that this only provided a short term delay of Do Nothing and was not considered to be a standalone strategic approach. An element of Do Minimum is, however, considered essential within the above options, delaying the need for major works and gaining benefit from existing defences.

5.1.3 Penzance Harbour

Overall approach.

The local study (Appendix C2) recognises the significant contribution that management of this area has on the broader function of Penzance. While the local study does consider the Do Nothing approach, it concludes that this would be severely detrimental to the function and landscape of the area, with little gain in terms of naturalisation of the coastline.

As such, the local study (in line with the SMP policy approach) focusses on the manner in which on-going management of the area might be achieved, looking at opportunities for modifying aspects of such management to mitigate impacts. The underlying problems in this area arise from general deterioration of existing defences and, with sea level rise, increased risk of direct flooding or flooding due to increased wave overtopping.

From this, the local study concludes two strategic approaches, as set out in Figure 5-7. Option 3 considered the implications of continued management through sustaining existing defences. Option 4 considered in outline further modification of Option 3 through to use of nearshore and shore connected structures.

It is recognised that in detail there may be further local scale alternatives, particularly in the area around the central car park, the Railway Station and main Pumping Station, with options for locally setting back raised defences. These would need to be considered at a more detailed scheme level (OBC level) taking account of local landscape and regeneration opportunities.

In addition to the above, the Strategy has to consider the potential options for improvements to the overall structure and use of the Harbour, being explored by the Harbour Development Group. At present, these options are only in concept stage of development but would, if progressed, have major implications on the way in which flood and erosion risk might be managed. Critical to integrating potential benefits would be the timing of such plans.

Figure 5-7. Strategic approaches to management of Penzance Harbour

The Harbour Development Option has, therefore, to be considered within the Strategy as a potential approach to management, very much from the perspective of when works would be required under either Option 3 or 4, considering whether works might be delayed to fit in with decisions being made at the larger scale.

The emerging plan for the Harbour improvements are indicated in Figure 5-8.

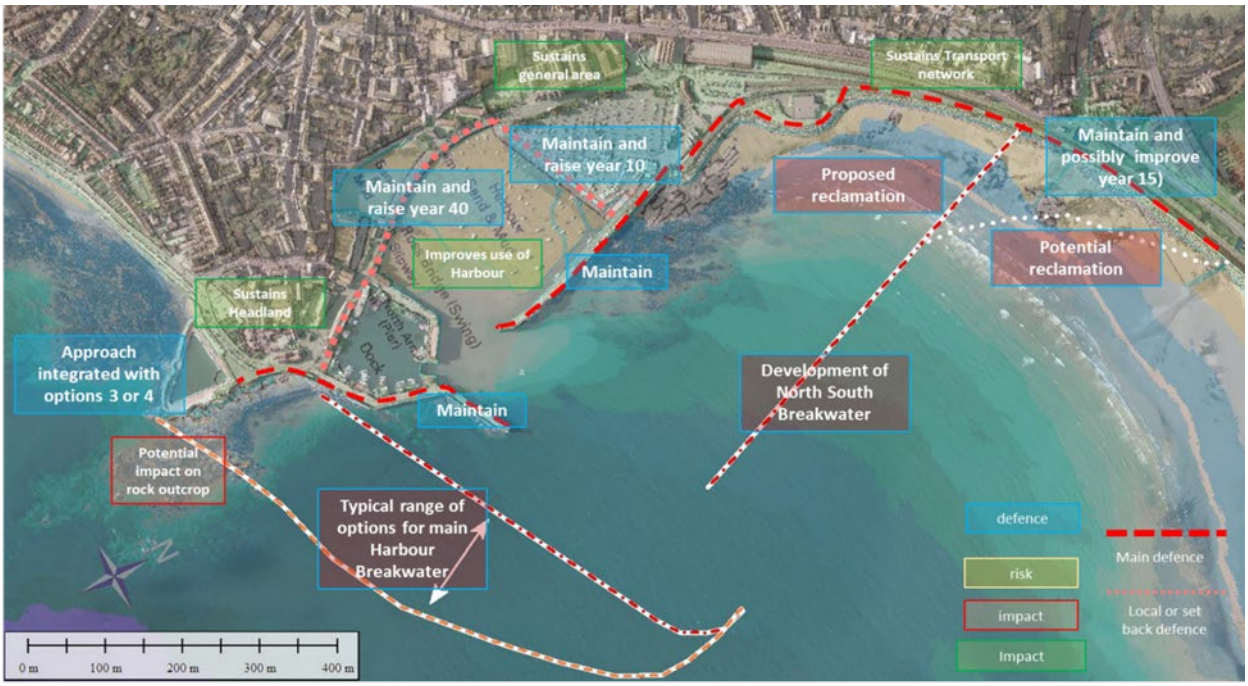


Figure 5-8. Schematic of Harbour Development approach (with implications for flood and erosion risk management).

Local Management Approach Options considered in relation to the broader Strategy

The two local short list options outlined above (as set out in Appendix C2) for management of the Penzance Harbour area have been taken forward into the assessment of the overall Strategic Management Approach options considered in developing the Strategy.

In summary:

- The local Do Nothing Option is taken forward as part of the baseline Do Nothing Approach for the whole strategy area.

In addition the two local options are taken forward into the development of the Strategic Management Approaches in developing the Strategy:

- Option 3 – Sustain existing defences;
- Option 4 – Sustain existing defences, introducing nearshore structures;

Both the above options will include additional consideration of how the potential development of the Harbour might influence these approaches, particularly with respect to timing.

Under Option 3 the main interaction is in relation to management of the Eastern Green / Longrock frontage and how this may be influenced by decisions made in that area. In relation to this, Option 3 for Penzance Harbour would, in effect, be a continuation of a HTL approach along the Chyandour frontage (local Option 3 discussed in Section 5.1.2),. Under the Sand Scaping option (Option SS in Section 5.1.2) there may be some benefit derived from the additional sediment supply from the Eastern Green / Longrock area.

In relation to the Penzance Harbour Option 4, there is scope for modifying the layout of both this option and that of the Eastern Green / Longrock Option 4 (B / C) to achieve greater efficiency in management of the two frontages in combination. Similarly, with respect to the Sand Scaping approach, there may be

ways in which the Penzance Harbour Option 4 might be modified to gain further benefit from the addition sediment supply.

At the western end of Penzance Harbour, Option 4 offers more scope to provide some additional protection to the Promenade and this is considered below (Section 5.1.4).

5.1.4 Penzance Promenade

Overall approach.

An outline assessment of options for this frontage are considered in Penzance Promenade Study (Mott Macdonald 2017) referenced in Appendix A. This study considered costs and benefits over the 100 year period, although focussing more on the management requirements over the next 40 years.

The study (Mott Macdonald 2017) distinguishes between the main Promenade area and management of the area around Wherrytown and the Foster Bolitho Gardens to the west, although the study combines these areas in developing a local short list of options. In addition to the Do Nothing and Do Minimum options (local Options 1 & 2), the study (Mott Macdonald 2017) generated a short list of five different options. However, from the Strategy perspective this short list may effectively be reduced to two fundamental strategic approaches as set out below.

- Strategic approach (3/4). Adaptative shoreline control options:
    - Local Option 3a, - Beach Control, Recharge, Managed Realignment + Secondary + Tertiary (where secondary measures include set back raising of the defence crest and tertiary measures include aspects such as traffic and access management).
    - Local Option 3b, - Beach Control, Recharge, Managed Realignment, Breakwaters + Secondary + Tertiary.
    - Local Option 4, - Breakwaters, Managed Realignment + Tertiary
- Strategic approach (5/6). Sustain existing defences:
    - Local Option 5, - Raise sea walls, raise secondary flood walls, modify sea wall profile, controlled flow down road (Secondary Options) + Tertiary
    - Local Option 6, - Raised wave recurve sea wall + toe protection

In addition, the study (Mott Macdonald 2017) examines the potential need to manage the outfall of the Lariggan River, alongside consideration of potential options of the low lying area within the Lariggan valley.

The study report recognises that works to sustain existing defences would need to address the deterioration of the defences and the risk of increased overtopping due to sea level rise into the future. This has been reviewed as part of the Strategy development considering these issues over the longer term. As suggested by the local study, consideration then has to be given to more direct protection to the existing walls, which it has been assumed would be in the form of an initial rock toe, improved over the longer term as a full rock revetment. This is shown in outline in Figure 5-9.

Clearly there is scope within this approach for reducing the scale of and/ or setting back defence along the Foster Bolitho Gardens section of the frontage, while still sustaining defence to the main Promenade area.

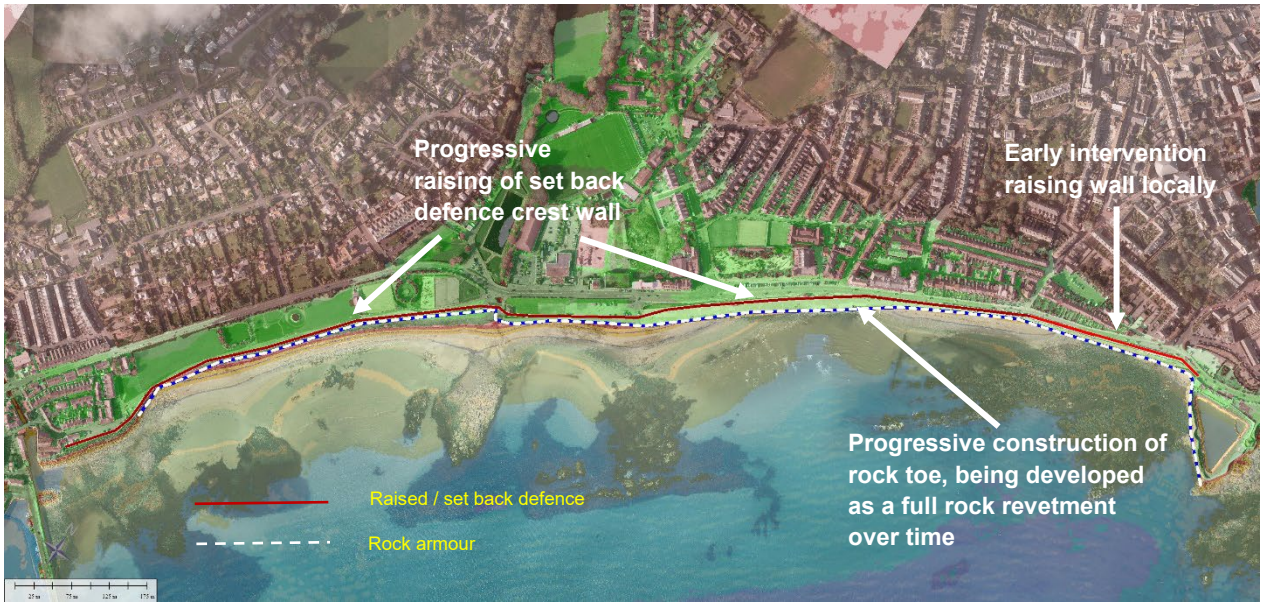


Figure 5-9. Outline of Option 5 / 6 - HTL to existing defence along the Promenade.

In terms of the more adaptive approaches to management, to effectively widen the defence system and dissipate wave energy in the nearshore area, the local study concludes that Option 3b offers the locally preferred approach. This option, shown in concept in Figure 5-10, does not constrain the more natural development of the Foster Bolitho Gardens frontage; reduces the visual impact associated with sustaining protection to the Promenade; and provides a more sustainable framework for enhancing the amenity use of the area.

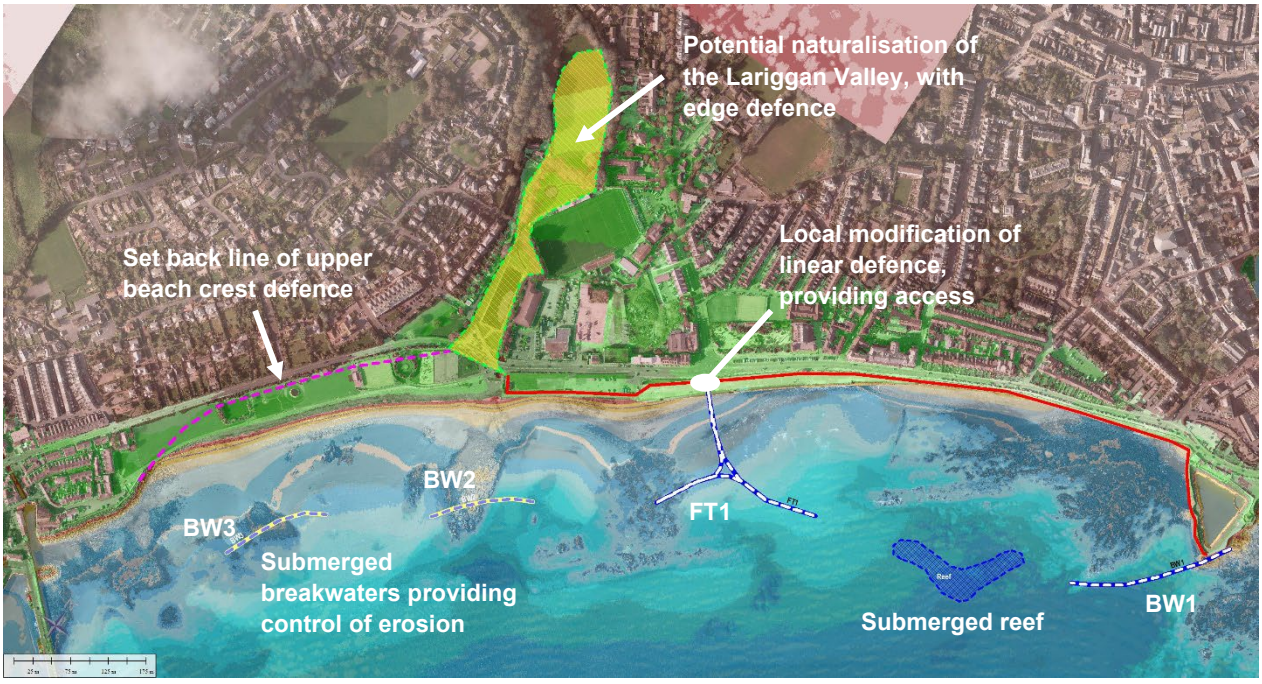


Figure 5-10. Concept layout of Option 3 / 4- Adaptive approach to defence of Promenade area

This adaptive approach would require introduction of sediment recharge, retained by the control structures, creating additional beach width, both in securing the face of the existing walls and in providing improved amenity.

In line with the overall concept of adaptation, this option introduces the potentially slightly longer term option of opening up the Lariggan Valley to tidal flow. Associated with this is the opportunity to reduce the risk of fluvial flooding due to outfall blockage and tidal locking. This, as recognised by the local study, would need to be developed in partnership with the local community and planning of future use of the Wherrytown area. The detailed decisions as to how and to what extent the valley might be opened to tidal flow might be deferred, possibly, until around Year 30. However the concept approach would need to be considered and agreed more immediately as acceptance of the concept of naturalising the valley would influence more immediate decisions around the form of defence at the coast and may also influence decisions in relation to land use planning.

Major works within the Promenade area would be required within the next 10 to 15 years, highlighting the need to resolve matters as to the approach to be taken and form of defence within the Strategy.

Local Management Approach Options considered in relation to the broader Strategy

The two local short list strategic approach options (developed from the local short list set out in the local area study (Mott Macdonald 2017)), outlined above for management of the Promenade area have been taken forward into the assessment of the overall Strategic Management Approach options considered in developing the Strategy.

In summary the short list strategic approaches are:

- The Do Nothing Option for the Penzance Promenade area is taken forward to the Strategy as part of the baseline for the whole area.
- Option 3 / 4, - Adaptive approaches to management, modifying the approach to management of the Foster Bolitho Gardens but with the sub-option for changing management to the Lariggan Outfall and Valley. This approach would need to be developed further with the local community and consideration of planned use of the area.
- Option 5 / 6 (a), sustaining HLT approach to management of existing defences over the entire frontage; notwithstanding the severe constraints imposed by sustaining the existing defences on use of the area.
- Option 5 / 6 (b), sustaining HLT approach to management of existing defences over the Promenade area but adapting management of the Foster Bolitho Gardens area.

In taking the two concept approaches, forward into the Strategy, further consideration is given to the distinction between the two main sections: of the Promenade and the Wherrytown to Tolcarne sections of the larger frontage.

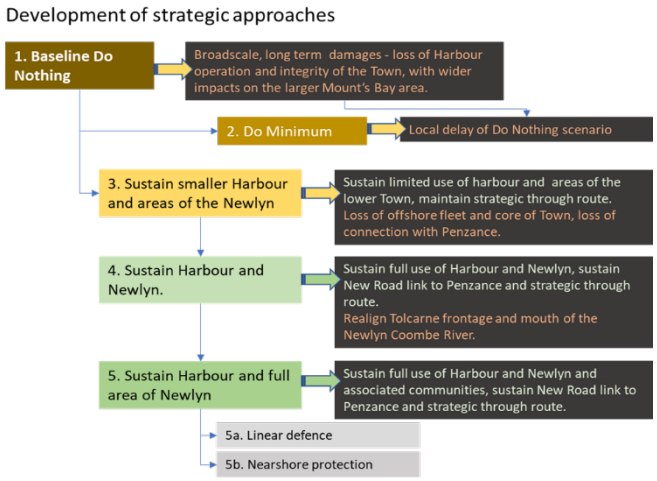
Even if there were justification for sustaining the existing defences to the main Promenade section, it cannot be concluded that this approach would be extended to the Foster Bolitho Gardens section. From a strategic perspective, therefore, three strategic approaches are taken forward in the development of the overall strategic approaches to management as bulleted above:

Option 3 / 4 has greater synergy with management of the Penzance Harbour area - Option 4 (Section 5.1.3), in the area of the Jubilee Pool area. Option 5 / 6 would be an extension of the basic HTL approach for this western area of Penzance Harbour (Option 3 in Section 5.1.3).

As discussed later for the Newlyn and Tolcarne area, there are already plans being developed for improved medium term management of the Newlyn Coombe River entrance that involves improvements to the rock stub groyne along the face of the Newlyn Harbour North Pier. This is compatible with either of the strategic approaches for the Promenade area set out above.

More distinct, in terms of combining management across the whole area, would be integration with the management approach to Tolcarne, specifically in relation to the management of the Foster Bolitho Gardens area. Clearly holding the line in the Foster Bolitho Gardens area (Option 5/6a) would be compatible with holding the line at Tolcarne. Taking a more adaptive to the Foster Bolitho Gardens area (Options 3/4 and 5/6b) would need to be considered in relation to either holding the line to Tolcarne or introducing a different form of defence in this area. This is discussed further in Section 5.1.5 below.

5.1.5 Newlyn Harbour and Tolcarne



The local study report (Appendix C3) recognised the importance of the Harbour and Town, identified by the SMP. However, this has had to be considered potential options involving the withdrawal of management of the main Harbour Piers and reducing the operational area of the Harbour.

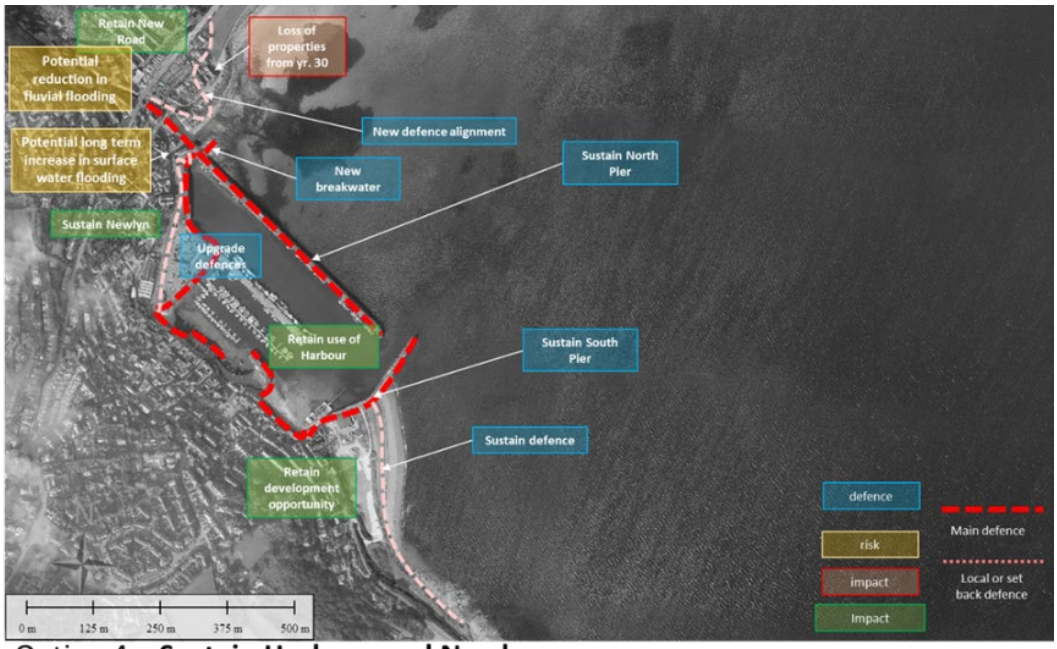
This is shown in concept in Figure 5-11.

Figure 5-11. conceptual approach in examining options for Newlyn

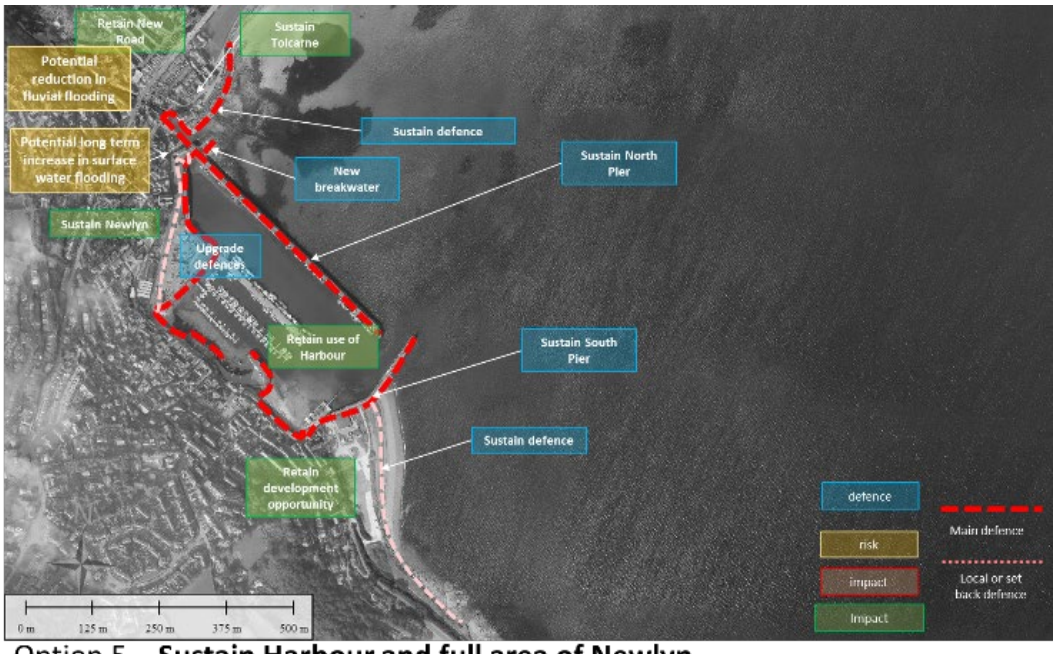
The main conclusion from the local study was that, taking account of the additional cost associated with change to the basic structure and use of the Harbour, the damages associated with loss of Harbour function and the additional cost of sustaining local flood defence to critical sections of the Town, was not a realistic or viable approach.

Following from this, the local study has demonstrated the need for integrated and a supportive partnership approach to management of the area.

The study went on to consider the degree to which management of the Tolcarne area might differ or be separated from management of the main area of Newlyn. At the local level, this generated two primary short listed options (Options 4 and 5) taken forward for inclusion with the Strategic Management Approaches as part of developing the overall Strategy. These options are outlined in Figure 5-12.



Option 4 – **Sustain Harbour and Newlyn**



Option 5 – **Sustain Harbour and full area of Newlyn**

Figure 5-12. Newlyn local options taken forward the Strategy.

The study identified two potential options for management of the Tolcarne frontage, either taking a linear approach (as shown by the red dashed line in Figure 5.13a) or looking at integrating a nearshore breakwater approach (as indicated in Figure 5.13b, reducing the need to improve the Tolcarne defence as shown by the dashed pink line in the figure). This alternative is potentially more compatible with an adaptive approach to management of the Foster Bolitho Gardens section of the Promenade frontage (discussed in Section 5.1.4).

Figure 5-13. Potential sub-options for management of the Tolcarne frontage.

Overall, therefore, the local study concludes that management should continue to the main area of Newlyn, maintaining the full operation of the existing harbour area as an integral element of maintaining the Town.

The current development of local defence improvements around the entrance to the Newlyn Coombe River is consistent with this strategic approach. At present this is being progressed to outline design level and would include construction of an improved stub breakwater as indicated in Figure 5-13.

Other options for management of the Harbour are currently being investigated. This potentially includes extending the South Pier and the possible redevelopment and construction of defences to Sandy Cove to the south of the South Pier. The potential for extending the South Pier has been modelled (in concept) as part of the examination of Newlyn Coombe area (Newlyn Tidal Options Report, Mott Macdonald 2019). This report indicated that the extension of Newlyn Harbour would not substantially impact on delivery of flood and coastal erosion risk management. Clearly, however, further development of such plans would need to be considered in relation to the broader scale management of the area but cannot at this stage be covered in detail by the Strategy, due to the current lack of detail in any proposals.

Local Management Approach Options considered in relation to the broader Strategy

From the local assessment (Appendix C3) it is concluded that, with respect to the Harbour and the core area of Newlyn, the strategic approach is to maintain defences. However, a key distinction is made in relation to the continued defence of Tolcarne. At the strategic level, this area needs to be considered in combination with emerging options for management of the Foster Bolitho Gardens section of the Promenade area. As such, two basic approaches are taken forward into the development of the full Strategy:

In summary:

- The local Do Nothing Option is taken forward as part of the baseline Do Nothing Approach for the whole strategy area.

- Local Option 4, - Sustain Newlyn Harbour and the core area of the Town, while considering managed realignment at Tolcarne.
- Local Option 5, - Sustain Newlyn Harbour and the core area of the Town, including sustaining defences at Tolcarne. The approach to management at Tolcarne would be considered in relation to synergies in the approach with Options for the Promenade area.

Under the above options, access would be maintained through to the coastal road to Mousehole.

5.1.6 Mousehole

The local study for the Mousehole area (Appendix C4) considered a range of options examining the potential loss of the coastal road (with the need for a major diversion through the hinterland) and the function of the two main Harbour structures in defence of the village.

The local study concluded that both as a local access route (to properties along the coastal road) and as the main access to the village, the maintaining the coastal road was the preferred option.

In relation to the Village, it was assessed that there would be major unacceptable flood and erosion risk to the core of the Village if the Harbour structures were abandoned in the future.

On this basis, it was concluded that, at a strategic level, the only sensible and viable option was for continued management of the whole area, supported by the need to sustain the Harbour structures. This recognised the significant long term cost required for maintaining and improving the Harbour structures.

This option sustains the important value of Mousehole to the wider area and is in line with the overall Strategy objectives.

Local Management Approach Options considered in relation to the broader Strategy

The local Do Nothing Option is taken forward as part of the baseline Do Nothing Approach for the whole strategy area

The preferred option taken forward to the Strategy for Mousehole is local Option 5b/4b, - sustain existing management (as described in detail in Appendix C4).

5.2 Summary of Local Options and Combination as Strategic Management Approaches.

The various local short listed options are set out in summary in Figure 5-14, presenting a complex array of different options for management across the whole area.

It may be seen that only in the case of how the Eastern Green / Longrock frontage is managed does the choice between options strongly or fundamentally impose a selection of an option on an adjacent area – i.e. the Marazion West frontage.

With respect to Tolcarne, the choice between whether or how the Tolcarne area is managed does influence (or is influenced by) choices made with respect to the Wherrytown area (i.e. it is unlikely that one would realign the area of Tolcarne unless one was also realigning the defence in the area of the Foster Bolitho Gardens). However, the reverse is not true, in that it might still be sensible to examine a more adaptive approach for the Wherrytown area even if the decision were made to sustain defences to Tolcarne.

Similarly, there is a need to examine the broader implications and interactions between management of Penzance Harbour and management approaches to the eastern end of the Promenade. If a more adaptive approach were taken to management of the Promenade, through the use of breakwaters, this would need to be integrated with an approach modifying the defence of the Headland and the western end of the Harbour area.

In terms of options for management to the eastern end of Penzance Harbour, it would be possible to modify the approach irrespective of how the Eastern Green/ Longrock frontage is managed. However, the way in which the Eastern Green/ Longrock frontage is managed would influence, in detail, how different approaches to the eastern end of the Harbour are actually delivered.

Attempting to rationalise how different local options combine at a strategic level (recognising the intent of the strategy is to examine choices between different outcomes), the next stage of the Strategy development examines in detail fundamentally different Strategic Management Approaches.

This is set out in Figure 5-14, presenting four primary Strategic Management Approach options, identifying possible sub-options that might be possible within these primary approaches:

- Strategic Management Approach 1 - Do Nothing across the whole area (baseline), with no sub-options.
- Strategic Management Approach 2 – Sustain existing defences, with sub-option 2a examining local variation.
- Strategic Management Approach 3 – Adaptive management to the Promenade area and to Eastern Green / Longrock, with sub-options 3a considering local variation and sub-option 3b considering realignment to Marazion West.
- Strategic Management Approach 4 – As Option 3 within the Promenade area but introducing the Option of Sand Scaping to the Eastern Green/ Longrock frontage, with sub-options 4a and 4b considering in particular local choices for Marazion West.

These various approaches are described and discussed in more detail below.

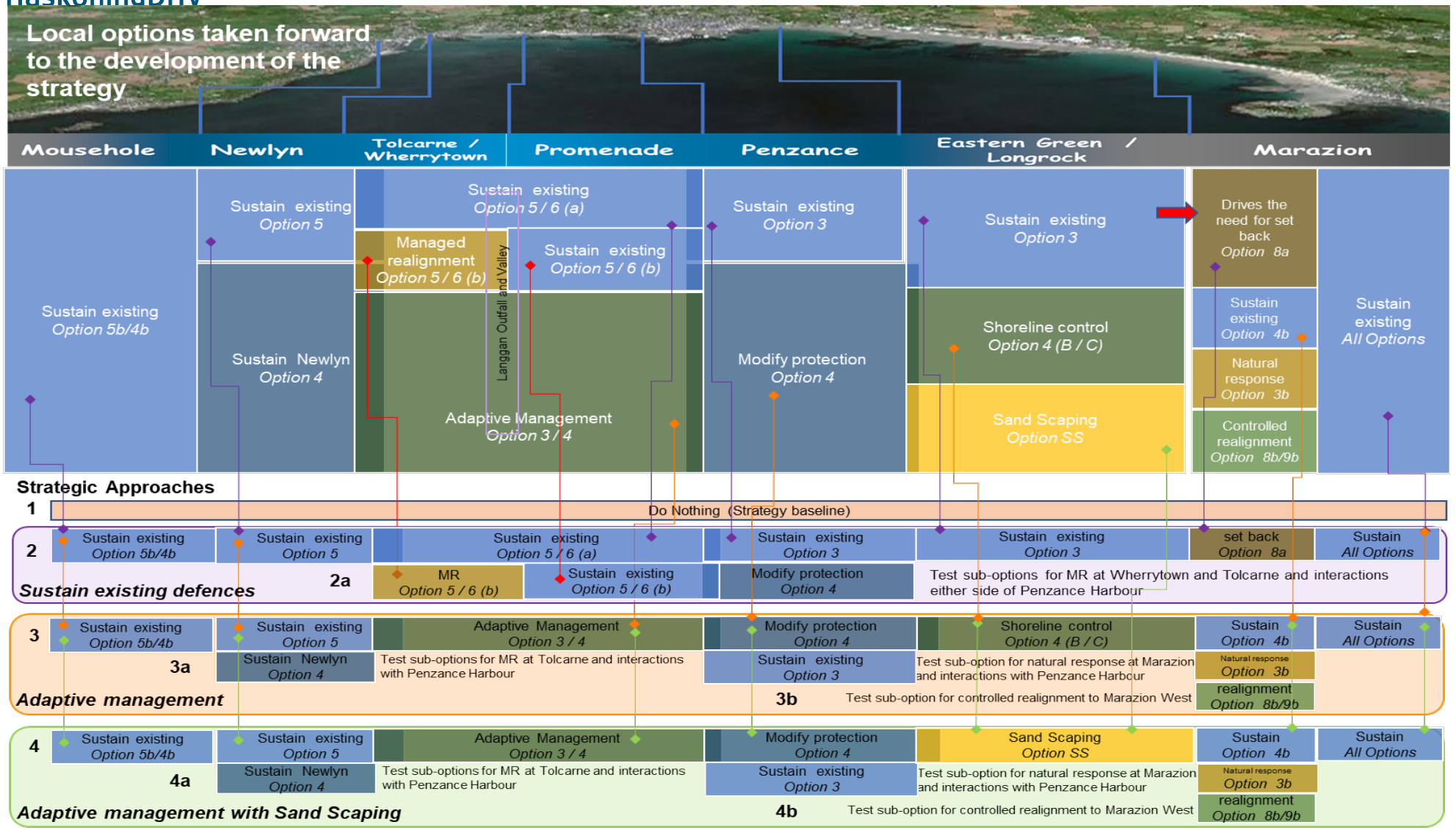


Figure 5-14. Summary of local short list options, combining these as Strategic Management Approaches

Strategic Management Approaches

- **Option 1. Do Nothing**. While this option has be ruled out in the detailed local assessments, this Option provides a baseline against which the benefits of management might be assessed. (It should be noted that in the local assessments, in no area is Do Minimum considered as a viable long term strategic option. In effect, some element of Do Minimum is considered as an essential component of the longer term options being considered, affecting the timing of when more major works would be required. In relation to the Do Nothing Option, Do Minimum would only delay the serious damages by a few years and is considered to be trivial at a strategic level.)

- **Option 2. Sustain Existing Protection**. Although this Option was not considered as being viable across the whole area (in particular along the Eastern Green / Longrock frontage, due to the significant impacts of the broader environment and due to concerns about long term sustainability), this option does form an important baseline and, therefore does need to be considered at the strategic level. This primary Strategic Management Approach option does allow consideration of how managed realignment along the Wherrytown frontage might mitigate the overall impacts of the more general "sustain" option for the whole Promenade area and how different approaches to management of Penzance Harbour might influence, locally, the way in which a sustained approach might be delivered in adjacent areas. This is considered as a sub-option:
    - **Sub-Option 2a**. Sustaining existing protection generally with MR to Wherrytown and consideration of modified defence to Penzance Harbour.

- **Option 3. Controlled Adaptation**. This approach option tests more generally the ability to adapt, creating the opportunity for greater flexibility in delivering the basic requirement for continued protection, establishing an overall framework within which there is better scope for integration with other plans being developed for the area. In key areas, as identified by the local assessments, existing defences would be sustained (Mousehole, Newlyn and Penzance Harbour), while in other areas options for adaptation would be considered (specifically along the Promenade and the Eastern Green/ Longrock frontages). Within this overall strategic aim, this Strategic Management Approach option would consider two sub-options:
    - **Sub-Option 3a,** testing sub-options for different approaches in relation to: managing the interaction between the Tolcarne and Foster Bolitho Gardens area, testing the different approaches and interaction between controlled adaptation and different approaches to management around Penzance Harbour and the interaction with respect to allowing the Marazion West frontage to function more naturally, with difference in terms of sediment supply, all within the context of adapting the approach to management where practical to do so. *(Note: Sub-Option 2a, above has already considered local adaptation but in the context of sustaining defences generally elsewhere.)*
    - **Sub-Option 3b,** building on the assessment of Sub-Option 3a to examine the opportunity to manage controlled realignment of the Marazion West frontage.

- **Option 4. Controlled Adaptation with Sand Scaping**. Building on Option 3 with the development of a Sand Scaping approach to the Eastern Green / Longrock frontage, replacing the need for control structures. This would initially be considered in relation to sustaining defence to Tolcarne and to the Marazion West area, with sub-options:
    - **Sub-Option 4a,** testing sub-options for different approaches in relation to: managing the interaction between the Tolcarne and Foster Bolitho Gardens area, testing the different approaches and interaction between controlled adaptation and different approaches to management around Penzance Harbour (*taken from Option 3a*) and the interaction with

respect to allowing the Marazion West frontage to function more naturally, with difference in terms of sediment supply.

- **Sub-Option 4b,** building on the assessment of Sub-Option 4a to examine the opportunity to manage controlled realignment of the Marazion West frontage, with difference in terms of sediment supply.

Each Strategic Management Approach option and sub-option is considered in relation to the overall strategy objectives discussed in Section 2.4.1, assessing particularly, at a strategic level, the environmental opportunities and constraints of each approach. This is considered in terms of the overall outcome of the Strategic Management Approach, considering the opportunities created for adaptation and the constraints imposed on the socio-economic and environmental system, considering also the adaptive capacity engendered in delivering greater resilience in response to current and future uncertainties.

This overall strategic outcome is further supported by an examination of:

- The Economic case, considering, in each case:
  - How the interactions across local boundaries influence the cost of delivering the strategic approach option,
  - Considering this both across the whole area and in relation to more local delivery of benefits
  - Considering the synergies and constraints in terms of timing and integration of works, alongside
  - Consideration of broader, strategic benefits and the potential or need for partnership approaches, together with,
  - The longer term sustainability in terms of incremental benefit / cost over time.
- The Financial case, considering the timing and synergies created by different approaches, considering more specifically the potential or need for partnership approaches.
- The Commercial case, looking again at synergies between elements of work and opportunities for modifying the timing of works.
- The Management case, highlighting how different options influence the way in which the overall Strategy might be developed and implemented.

This assessment is discussed and set out in detail in the following section (Section 6), with a comparison of approaches summarised in Section 6.2 and the Preferred Strategy set out in Section 6.3.

6 Assessment of Strategic Management Approach Options

6.1 Strategic Management Approach Option Assessment

6.1.1 Strategic Management Approach SO1 – Do Nothing

6.1.1.1 Description of Option and sub-options

The Do Nothing Approach is covered within Section 4.1 of this report. The overall approach assumes that there would be no maintenance or improvement to existing defences and that defences would be allowed to fail, although it has been assumed that Penzance Harbour South Pier and Albert Pier might still provide a degree of protection through to 2050, with some protection provided by the main Harbour structures at Newlyn and Mousehole potentially through to around 2070 (as discussed in Section 4.1.1.1).

More locally there would be continued overtopping and flooding to the northern end of the Promenade, continued flood risk associated with the intense wave action within the entrance to the Newlyn Coombe River, continued flood risk under more extreme conditions to the main car park within Penzance Harbour and continued risk of flooding to the railway line and station in the Chyandour area. In addition, Marazion Marsh would continue to be at risk from saline inundation under more extreme storm conditions, with potential flood risk to the Railway behind the Marsh.

Within the next 10 years to 15 years there is the significant risk of failure along several sections of the Promenade, with the probable failure of defences and immediate loss of property at the entrance to the Newlyn Coombe River within 5 to 10 years. This would also impact on the use of the North Pier, with a consequential impact on operation of the Harbour over this period of time. Sections of defence along Eastern Green and Longrock would begin to fail over the next 10 to 15 years, becoming increasingly vulnerable to more major storm events. The risk of extreme levels of flooding occurring under a 1 in 10 year (T10) storm condition are shown in Figure 4-5, affecting the railway, the A30 and much of the development zone and residential properties around Eastern Green and Longrock.

With continued deterioration of the Penzance South Pier, within 10 years there would also be loss in the Headland area, threatening the Jubilee Pool, alongside operational loss to the Harbour.

Defences to Mousehole, Newlyn and Marazion are considered to be slightly more resilient. Failure of the defence to the road to Mousehole would occur over the next 20 to 30 years, although as identified above, the main loss to the Village of Mousehole might be delayed to around 2060/ 70 (typically Year 40 to 50). The operation use of Newlyn Harbour would decrease over time, with loss of access, loss of berths and moorings and lower standards of protection, with more substantial flooding and erosion to the Town by Year 50. The low lying western part of Marazion would be affected by 2050 (Year 30), with loss of the car parks and important open space, with potential failure occurring to individual defences around the core of the Town typically by Year 25 to 35.

As defences fail, there would be increased frequency of severe flooding across the whole area, alongside rapid erosion as the shore sets backs to its more natural position. The impact on the area would be immense, radically altering the landscape character of the area, impacting on current use and values and altering the very nature of Mount's Bay.

6.1.1.2 Overview of constraints and opportunities

Key areas for regeneration, including: Newlyn, The Promenade, Penzance Harbour and the Penzance Gateway zone (Longrock and Eastern Green), would suffer significant loss but also would be unable to deliver any of the core aims and vision set out in the Neighbourhood Plans.

There would inevitably be a lack of confidence for investment, not least in terms of future development of the two main Harbours but also in terms of development in key areas such as Eastern Green and Longrock. With the loss of the new rail service depot there would be little appetite for further investment in rail infrastructure and the loss of both rail and road connectivity in terms of the national, regional and local connectivity would severely constrain the ability to attract outward looking investment in the wider area.

There would a significant impact on current connectivity to the Isle of Scillies with both socio-economic and more direct economic impacts, both within the Penzance area and affecting the Isles of Scillies.

There would be the need for major investment in addressing social issues arising from the loss of peoples' property and livelihoods, with the need for individuals to relocate or be found suitable alternative housing. In addition to the physical "bricks and mortar" loss, the loss of individual capital and resources, especially if requiring social care, would place a significant burden on the local authority.

While notionally, Do Nothing would create opportunity for re-naturalisation of the shoreline, with the potential opportunity to allow development of saline marsh (in particular within the area of the current freshwater Marazion Marsh area), there would be the need for substantial "clean up" works if this opportunity were to be realised. These issues have previously been summarised in Figure 4-11.

With reference to Figure 4-14 (*Opportunities for sustainable management*), Figure 6-1 provides an overall assessment of opportunities and constrains delivered by this Do Nothing option.

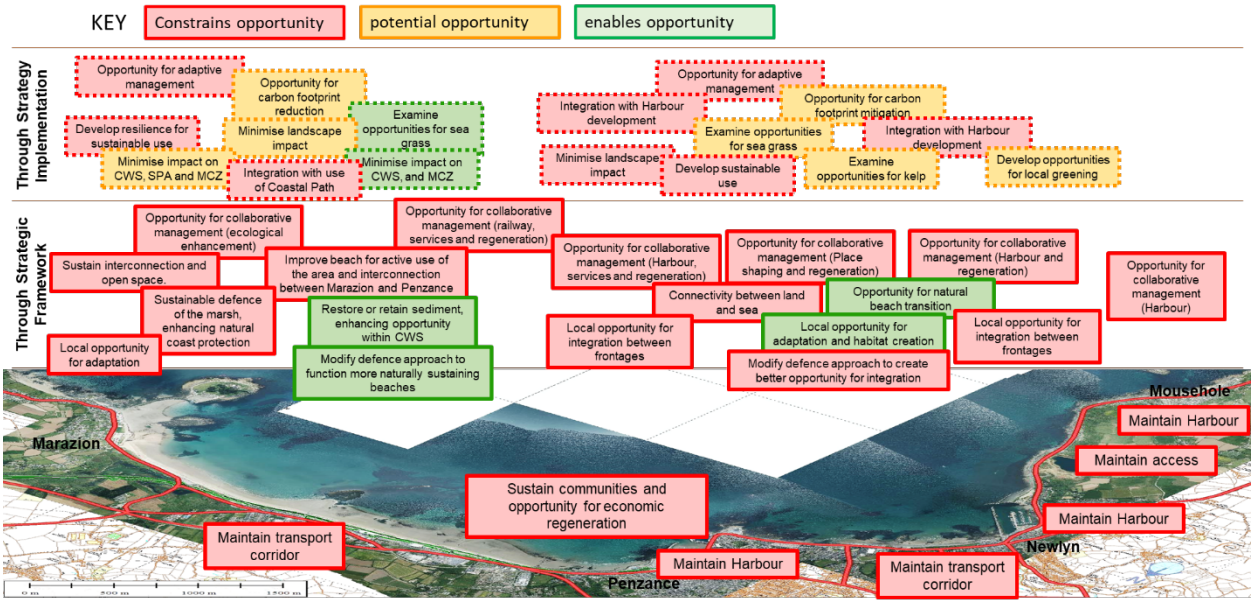


Figure 6-1. Opportunities and constraints associated with SO1 - Do Nothing

Adaptative Capacity

While the Do Nothing Strategic Management Approach would require major adaptation (i.e. change in use and the need to adapting to change), the option provides very little scope for managing this requirement

over the short term. Effectively, a Do Nothing approach forces and limits subsequent choices. Over the longer term, this would mean that future decisions would be made within a context of failing defences, closing off any opportunity for regeneration or place shaping.

As indicated in Figure 6-1, opportunity is created in terms of allowing the natural function of the Eastern Green / Longrock frontage and creating opportunity for habitat creation within the area of the Promenade. However, this at the expense of a more integrated approach meeting the broader scale, holistic aims of Cornwall's Environmental Growth Policy. Critically under this overall approach, the opportunity is lost for collaborative management associated with the Harbours, service providers and the transport network.

Strategic summary

A detailed assessment of this options is considered through the SEA being undertaken in combination with the development of the Strategy. Within this section of the report, an overview is provided based on the Strategy objectives (Section 2.4) and set out in line with the core aims related to the Cornwall Environmental Growth Policy (economic, health and security and the natural environment) and incorporating critical aspects of Defra's policy statement, as discussed in Section 2 of this report.

This overview is presented in Figure 6-2,with negative impacts, on a scale of 1 to 3 (moderate to high), shown by bars extending to the left and positive impacts extending into the green zone to the right.

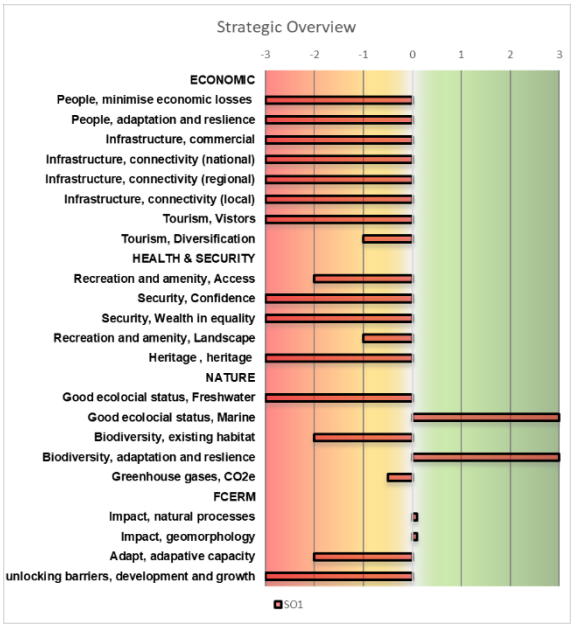


Figure 6-2. Strategic Overview - SO1

As identified above the Do Nothing baseline option has substantial negative impact of the overall economic aims, affecting local communities, the ability to sustain the regional economy, with severe loss of interconnectivity. Alongside this, no longer protecting the strategy frontage reduces the access to the shoreline, impacting on amenity and landscape and failing to maintain the underlying heritage of the area. In addition, as result, it reduces confidence and security in people's lives, especially with the loss of property, increasing wealth inequality.

While there is potential for increasing areas of saline habitat and diversity, this would be at the expense of the Marazion freshwater marsh.

As a risk management approach this option does restore the natural function of the shoreline but does not support the intent to allow development of an adaptive approach and fails to unlock barriers for development and growth of the area.

The Option does not deliver the strategic aims incorporated within the Strategy Objectives.

6.1.1.3 Economic, Commercial, Financial and Management Assessment

Economic Assessment

As a baseline for assessment and comparison with alternative approaches, the following assessment has been made of the economic damages. This is broken down into specific sections of the coast, highlighting where receptors are associated with specific lengths of defence. More strategic infrastructure and features are also identified separately, highlighting where such strategic impacts are associated with several

lengths of the coast. Further details of the approach to the strategic level economic assessment are provided in Appendix D.

Table 6-1 sets out the assessment of the Do Nothing baseline of economic impacts. This analysis does not take account of full economic impact on the region or the local economy nor does it take account of the significant social costs associated with permanent relocation of individuals. The values do not consider the opportunity losses that would occur associated with aspects such as regeneration or delivery of the Neighbourhood Plans for revitalising the Mounts Bay area, nor the potential opportunities for redevelopment of the two main Harbours.

Commercial
Delivery of this Do Nothing option would be in a piecemeal manner, reacting to damage to defences as they occur, with significant challenge from those affected, urging the need for repair or reinforcement of defences. Should this Strategic Management Approach be taken forward, despite even a notional acceptance of this and the need for individuals and individual organisations to plan for change, given the scale of change (and in some areas the imminent need for such planning), in reality this planning is unlikely to happen with the timescales identified in Section 4.

This approach, across the whole area, would not result in a well-structured or viable procurement approach. From a commercial perspective this Do Nothing Strategic Management Approach would be unacceptable and is unlikely to be deliverable in a coherent manner.

Financial
The economic case highlights the extreme economic challenges this Do Nothing Strategic Management Approach would incur. There would be significant costs associated with managing the need to respond to the resultant change. These costs would fall primarily on the local authority, both immediately and increasingly over time. While there might be some benefit in terms of reducing costs associated with defence and, over time, in the re-naturalisation of the coastline, this would need to be considered alongside the major costs associated with “cleaning-up” and addressing the commercial and social implications.

It is extremely unlikely that there would be any partnership funding and, given the resource and funding that would be required to address the challenges, it is questionable whether this would be affordable given the priority for other expenditure in other areas.

This Do Nothing Strategic Management Approach is considered unaffordable, given also the major economic impact on the area.

Management
Given the scale of change envisaged, there would be major challenges in managing this change. There would be on-going challenge from the commercial sector and from communities. The scale and speed with which change would occur would require a level of management which is unlikely to be sustained.

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Table 6-1. Assessment of Do Nothing Damages

Item	Mousehole	Coastal Rd.	Newlyn Centre	Tolcarne	W'town (FBG)	Promenade	Penzance	Longrock / E'Green	Marazion West	Marazion Town	Total £M
Property damages (£k)											
Res. Write off	£4,429	£1,131	£947	£3,977	£1,337	£17,552	£8,047	£24,281	£661	£5,033	£67M
Res. Non write-off	£2,672	£0	£551	£461	£1	£3,559	£73	£9,292	£679	£0	£17M
Non res. Write off	£1,026	£0	£1,526	£1,880	£87	£13,072	£9,258	£26,165	£1,427	£1,661	£56M
Non res. Non-write-off	£557	£0	£3,373	£304	£0	£1,423	£582	£26,224	£144	£31	£33M
Associated damages	£4,640	£0	£1,519	£614	£0	£4,358	£155	£17,062	£856	£6	£29M
Total property (£M)	**£13.32M**	**£1.13M**	**£7.92M**	**£7.24M**	**£1.43M**	**£39.96M**	**£18.11M**	**£103.02M**	**£3.77M**	**£6.73M**	**£203**
Affected Residential	214	13	60	113	205	387	408	395	25	205	2025
Strategic damages (£M)											
Local roads (realign)	£14.4M				£2.98M				£0.5M		£17.9M
Offshore fishing fleet (transfer year 10)			£37.8M								£37.8M
Inshore fishing fleet (loss year 50)			£26M								£26M
Jubilee Pool						£4.5M					£4.5M
Main pumping station							£0.92M				£0.92M
Railway Station							£9.06M				£9.06M
Harbour Operation							(information not available)				-
Main road (A30) (realign)								£13.7M			£13.7M
Railway (asset value)								£40.6M			£40.6M
Rail Service depot								£7.1M			£7.1M
Public Car parks	(incl.)		(incl.)			(incl.)	(incl.)	£0.75M	(Private)		£0.75M
Coast Path and cycle way		(incl.)	(incl.)	(incl.)	(incl.)	(incl.)	(incl.)	£4.5M	(incl.)		£4.5M
Tourism / Amenity	(information not available))		(information not available)			£23.7M	(information not available)	(information not available)	(information not available)		£23.7M
Clean-up (typical by ha.)	£0.07M	(incl.)	£0.1M	£0.11M	£0.2M	£1.27M	£0.44M	£3.03M	(incl.)	£0.35M	£5.57M
Total Strategic (£M)	**£14.47**		**£63.9**	**£0.1**	**£32.65**		**£10.42**	**£69.68**	**£0.5**	**£0.35**	**£192.07**
Total Damages (£M)	**£28.92**		**£71.82**	**£7.34**	**£74.04**		**£28.53**	**£172.70**	**£4.27**	**£7.08**	**£394.70**

Notes: All values are recorded as Present Value Damages (PVd) determined over the 100 year Strategy period.

6.1.1.4 Summary Discussion of Strategic Management Approach - Option 1.

This Strategic Management Approach is not considered acceptable and is unlikely to be deliverable within the time period within which change would occur (i.e. before defences fail). This **Do Nothing option is rejected** and forms merely the baseline against which other Approaches are considered.

The economic assessment summarised in Table 6-1 does highlight the different level of economic impact across different areas of the strategy area and this is considered in more detail examining the potential for more adaptive approaches, including the examination of local Do Nothing as part of the broader scale management of the whole area.

6.1.2 Strategic Management Approach SO2 - Sustain Existing Protection

6.1.2.1 Description and Assessment of Option and sub-options

The implications of this option are set out in Section 4.2, with a discussion of the physical response of the shoreline explained earlier in in Section 3 (supported by the more detailed local analysis provided in Appendix C).

In general terms this Strategic Management Approach aims to sustain and improve the existing defences over the whole area, as shown in Figure 6-3.

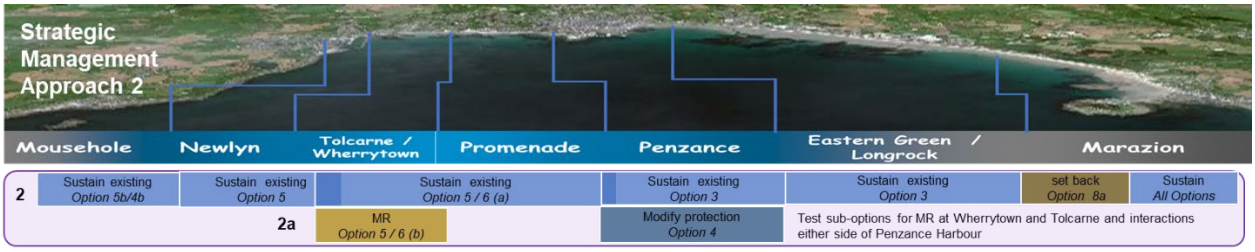


Figure 6-3. Strategic Management Approach option 2.

This approach assumes that the major harbour structures continue to be maintained, both as critical infrastructure, sustaining the operation of the three main Harbours, and also as important elements of management of flood and coastal erosion risk.

Between these harbour areas, defences along the full length of the Promenade and along the Eastern Green / Longrock frontage would continue to be maintained and reinforced. More immediately this would include improving the defence standard in areas such as the entrance to the Newlyn Combe River, the northern section of the Promenade and along the railway line immediately to the east of Penzance Harbour.

Typically, improvements to these defences have, from a strategic perspective, been assumed to be in the form of rock revetments, adding to the existing defences or providing additional support and reducing the level of overtopping of existing vertical walls. This approach aims to minimise the need to raise the crest level of the existing defences, while also minimise the impact of beach loss due to scour.

Even so, with sea level rise, there would be the need to substantially raise defences and extend the toe of the defences over the foreshore, as foreshore levels decrease. The approach focusses on sustaining the defence rather than addressing the more fundamental geomorphological change, with a continued loss of sediment at the shoreline.

At Marazion, the approach would aim to sustain the exiting defence to the main core of the Town. However, as set out in the detailed assessment of the frontage (Appendix C1), the lack of sediment supply feeding through from the Longrock area, drives the need for adaptation along the Marazion Dunes and western part of the Town, with maintenance of the dune or the existing defence line becoming unsustainable. (This is shown in Figure 6-2. as an integral part of the Strategic Management Approach.)

While this approach would aim to provide a more co-ordinated planned response, to a degree, in practice, the approach would develop in a reactive manner over the longer term in response to damage and change in sea level rise. Such damage to defences would trigger the need for more detailed development of specific local options but within the overall strategic approach to maintain and sustain the existing defence line.

A key aspect of this approach is that, as defences are reinforced, the initial form of management tends to drive this approach into the future (i.e. as more investment (specifically over the short term) is made in sustaining the existing defence system there is less opportunity and justification to adopt a more adaptive approach to management.) In effect, decisions being made now constrain the approach into the future.

Within the overall approach, it is recognised that in specific local areas there may not be the justification for continued defence given the low level of economic justification. For example, there is little economic justification for continued defence to the west of Wherrytown (the Foster Bolitho Garden area) at the western part of the Promenade, as indicated in Table 6-1.

Sub-option 2a considers and accounts for this within the overall context of maintaining the defence to the rest of the Promenade. Associated with this, the development of the strategy has identified the potential modification of defences to the southern and northern ends of Penzance Harbour. Sub-option 2a considers this, again within the context of sustaining existing defences within adjacent frontages.

6.1.2.2 Overview of constraints and opportunities

Although potentially there might be the need for some local adaptation (sub-option 2a), forced upon the overall approach by lack of funding necessary to continue to maintain defences everywhere, overall the approach aims to consolidate risk management through maintenance of the existing defence systems.

This maintains certain opportunities for management, with the emphasis on the economic and built environment, but also significantly constrains and reduces opportunities in relation to other values associated with the coast. This balance, with reference back to Figure 4-14, is captured in outline in Figure 6-4.

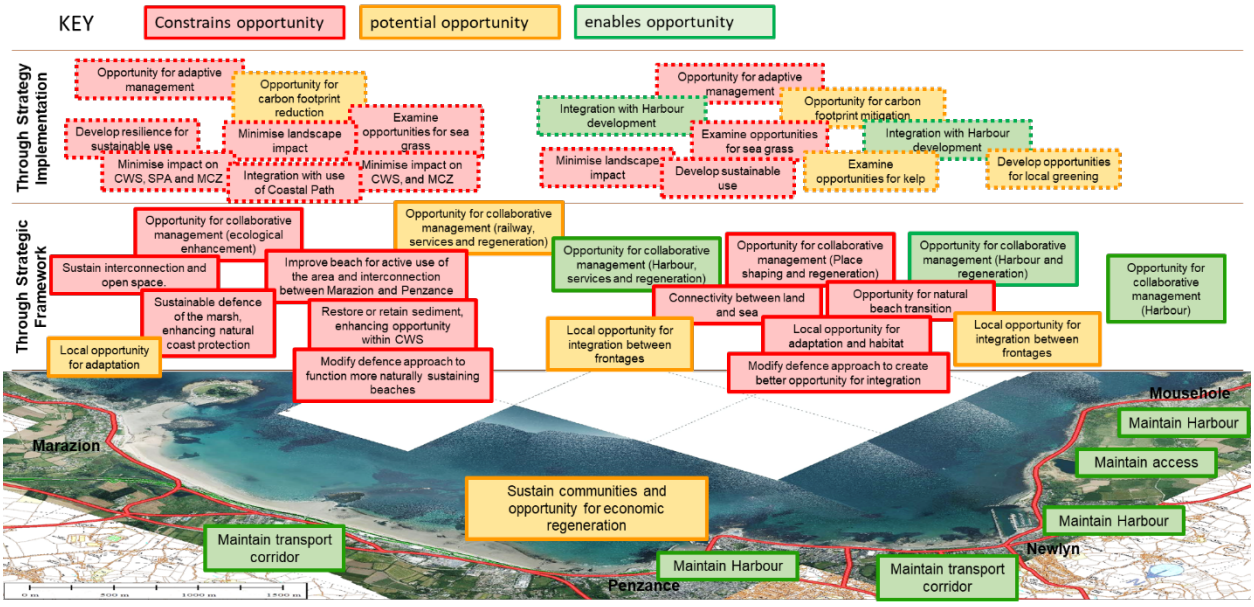


Figure 6-4. Opportunities and constraints associated with SO2 - Sustain Existing Defences.

The figure highlights the emphasis on protection of the built environment but at the expense of delivering the more integrated approach set out in Cornwall's Environmental Growth Strategy and this is developed further in the strategic summary below.

However, it should be noted that even with respect to the economic and built environment, the sustain existing defence approach constrains the delivery of core aims of the Neighbourhood Plans. In particular, the approach imposes a very fixed defence barrier, increasing separation between land and sea.

Over the eastern part of the area, the coast path and cycleway are sustained purely as a route along the crest of the defence, getting from “A” to “B”, with little opportunity either to link with use of the foreshore or the creation of waypoints for enjoyment of the natural coast.

Along the Promenade, the increased separation of land and sea, works in a significant and substantial manner to constrain the opportunity for creation of Place and regeneration of the Promenade as a series of open spaces of activity and interest.

Adaptative Capacity

The principle underpinning this Strategic Management Approach is to continue to reinforce and improve existing defences (where this can be economically justified) along a fixed alignment. While this is considered over a strategic timeframe, the approach is fundamentally reactive, responding to increased risk due to sea level rise and on-going deterioration or storm damage.

As such, investment would tend to be made over limited areas in a relatively piecemeal manner as the need arises. Since maintaining the defence in one location relies on the integrity of adjacent defences, local decisions would be made strictly in relation to continuing to sustain the overall linear integrity of defence over the whole frontage. As defences are progressively improved this limits the ability to adapt in any local area. In effect, previous investment reinforces the need to further invest in linear defences.

An example of this is the past approach to management of the Eastern Green / Longrock, where additional defences have been added gradually resulting in the development of linear defences over the whole frontage.

In the case of the Promenade, the need to maintain the integrity of the line as the front-line defence, limits the scope or options for future opening up of the Lariggan valley, with the option for setting back defences along the Foster Bolitho Gardens still being focussed around a fixed alignment for defence rather than a more adaptive transitional zone.

The form of the linear defence along the Promenade is maintained, with the response to longer term risk being that of raising defence levels, limiting the opportunity for defence to be developed interactively with the use of the area. Effectively the defence determines the use of the area.

Applying the Strategic Management Approach across the Eastern Green / Longrock frontage, as historically demonstrated, limits the opportunity for adaptation. Indeed, the approach with the associated impact on the beach, resulting in on-going lowering of the beach, reinforces the need for further investment in linear defence.

Attempts have been made through the design of the most recent works along this frontage to mitigate this to some degree, widening the defence zone and allowing better integration with the Coast Path. However, this approach has been developed on the principle of providing only a short term alleviation of the problem and this recent defence would need to be further reinforced as a larger linear structure in the future (potentially over the next 20 years).

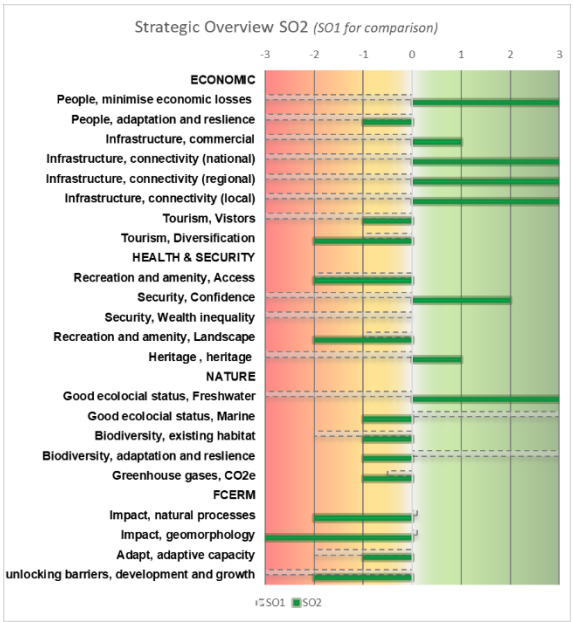
Furthermore, continuing this linear defence approach fails to address the longer term trend of loss of sediment supply to Marazion Dunes and to the western Marazion frontage. As set out in Appendix C1, this

limits the viable options for management to the area of dunes and western Marazion, determining and hastening the need for local realignment of defences in this area, forcing the reliance on a hard linear approach to management of the road to protect Marazion Marsh and constraining the opportunity to develop a more sympathetic approach to management through engagement with the community.

While the historic defence around the Harbours limits the scope for adaptation, this approach, applied across the whole area is considered to reduce the opportunity for longer term adaptation over the two large areas extending from the western section of Marazion through to Penzance and across the area of the Promenade.

Strategic summary

A detailed assessment of this option is considered through the SEA being undertaken in combination with the development of the Strategy. Within this section of the report an overview is provided based on the Strategy objectives (Section 2.4), set out in line with the core aims related to the Cornwall Environmental Growth Policy (economic, health and security and the natural environment) and incorporating critical aspects of Defra's policy statement, as discussed in Section 2 of this report.



This overview is presented in Figure 6-5.

While the approach delivers against the overall FCERM economic indicators, in terms of substantially reducing the risk of loss of property, transport and supporting existing economic development, the hardening and raising of defences will overtime increase the separation between land and sea, perpetuating and reinforcing the current situation.

With increased impact on the landscape and ever-increasing pressure on the natural environment, alongside constraints of access, the attractiveness of the area both supporting recreation and connection with the natural environment will fail to deliver vitality to the area, with the potential for reduced tourism or diversification of tourism.

Figure 6-5. Strategic Summary for SO2.

The approach constrains fully the further natural processes of the shoreline, significantly impacting on the overall geomorphological development and the ability to retain sediment over the foreshore. This closes down future opportunity for adaptation and fails to unlock barriers for development and sustainable growth.

While the Strategic Management Approach SO2 performs significantly better than the Do Nothing, overall, it fails to deliver the broader Strategic benefits. The Approach, specifically over the Promenade and Eastern Green / Longrock frontages does not address the concerns expressed within the SMP nor does it, therefore, comply with the SMP policy in these areas.

This would be slightly mitigated through adoption of Sub-option 2a, where local adaptation is considered in the Foster Bolitho Garden area and through the identified need for realignment and set back defences over the western part of Marazion. However, even in the latter area, the change in management is being

forced by the lack of sediment retention, with the intent to reinforce the defence to the road once the dune is lost.

6.1.2.3 Economic, Commercial, Financial and Management Assessment

Economic Assessment

Damages.

At the strategic level it is taken that defence would be improved to maintain current use of the area, providing an appropriately high standard of protection. As such, it is assumed that there would be no residual damages. This assumption would need to be tested in developing schemes in specific areas but provides a consistent baseline for assessing different Strategic Management Approaches.

The benefits of continuing to provide this standard of defence derive from the avoidance of damages set out in Table 6-1, with a total overall PVb benefit of £395M.

Costs and Cost Profile.

The cost of this approach is built up from an assessment of actions required for each defence length over the full 100 year period of the Strategy, allowing consideration of more specific local areas. The overall results of this assessment are presented in Figure 6-6 for the whole area.

The figure shows an overall cash cost of Approach SO2 in the order of £319M, with a Present Value cost (PVc) of £97M. Two areas of potential change are identified, with respect to management of the Foster Bolitho Garden area and in relation to the modified approach to management to the northern and southern end of Penzance Harbour. In terms of the modified approach to management of the Harbour, this does increase initial costs (Figure 6-6, Option SO2a), with the realignment along the Foster Bolitho Gardens area reducing the longer term management costs to the wider Promenade frontage.

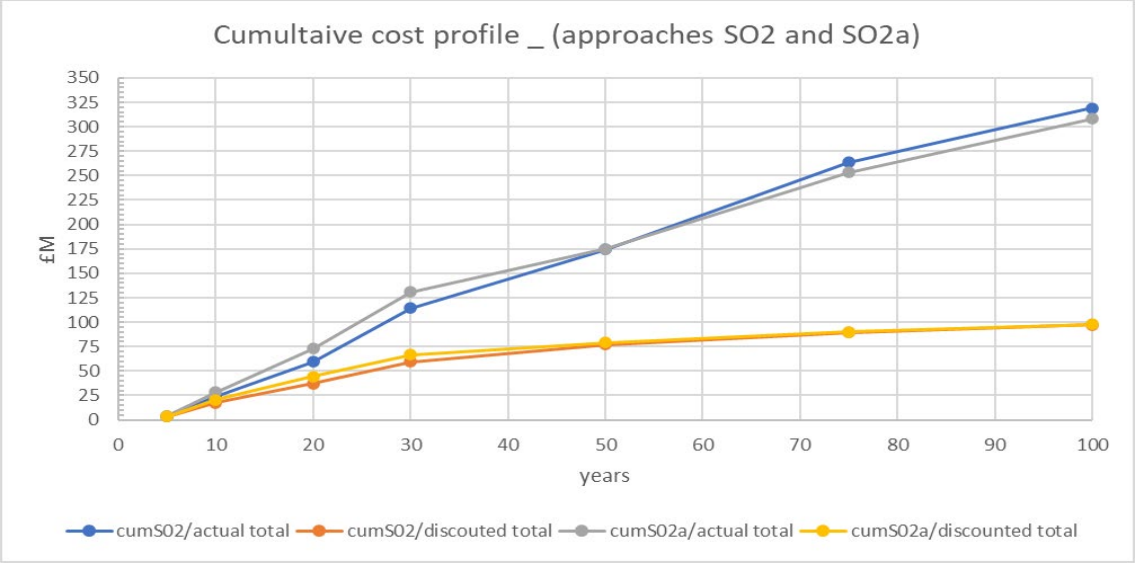
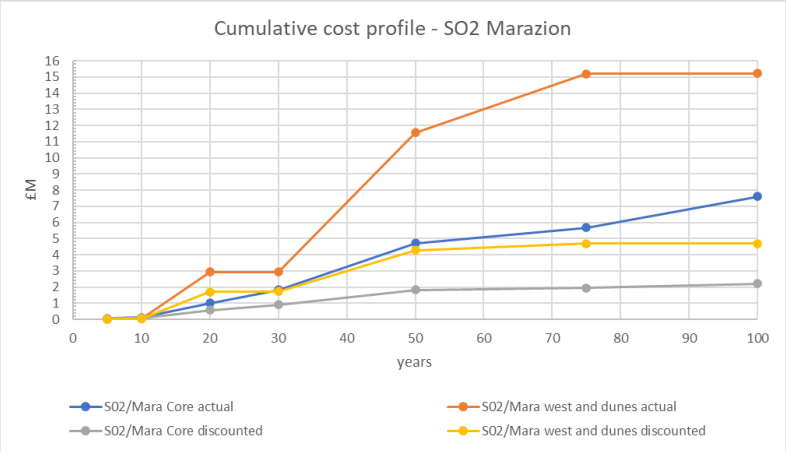


Figure 6-6. Cumulative Cost Profile - approaches SO2 and SO2a

These variations are highlighted in Figures 6-9 and 6-10 as part of the more detailed cost analysis of different sections of the frontage.

Marazion (Figure 6-7)

Defence to the core of Marazion is estimated to cost in the order of £7.6M (PVc £2.2M). The larger cost (cash cost £15.2M (PVc £4.7M)), shown in Figure 6-7, is associated with management of the western part of the Town, Marazion Marsh and Dunes.



Given the need for realignment over the western section of the Town, there would be loss of part of the car parks and local facilities associated with the car park area (this is shown earlier in Figure 5-1).

Figure 6-7. Defence cost profile for Marazion - SO2.

While this area would continue to be managed, providing some opportunity to manage these losses, typically there would be some longer term residual damage. This is assessed typically as being in the order of £270k (PVd). The comparison of costs and benefits are set out in Table 6-2.

Table 6-2. Benefit cost analysis - Marazion SO2

	Western section £M	Core Town £M	Total area £M
Do Nothing PVd (Table 6-1)	4.27	7.08	11.35
Residual Damages (SO2)	0.27	0	
Benefit (PVb)	4.0	7.08	11.08
Costs	4.7	2.2	6.9
Net Present value (NPV)	-0.7	4.88	4.18
Benefit Cost Ratio (BCR)	0.85	3.22	1.61

Works along the Marazion Dune and Marazion Marsh area would continue to provide benefit to the railway line and these potential damages are accounted for in the assessment below for Longrock. Furthermore, it is recognised that failing to manage the Marazion Dune frontage would impact on the use of the Coast Path as well as impacting on recreational use of the area more generally. The impact on the coast path is also considered in relation to the Longrock area.

As such, it is not possible to consider the Marazion area as a fully separate area. Even so, the analysis does highlight that under this approach, the lack of sediment feed into the area results in questioning the economic justification for management under this scenario. Balancing this to a significant degree is the requirement to sustain the important freshwater marsh.

Eastern Green / Longrock (Figure 6-8)

Costs associated with the Strategic Management Approach SO2 over the Eastern Green / Longrock frontage is estimated as being in the order of £114M (PVc £35.2M). The cost profile highlights the steeply rising costs from Year 20 through to Year 30 as defences are improved, with an increasing cost over the longer term as defences continue to be improved with sea level rise and beach loss.

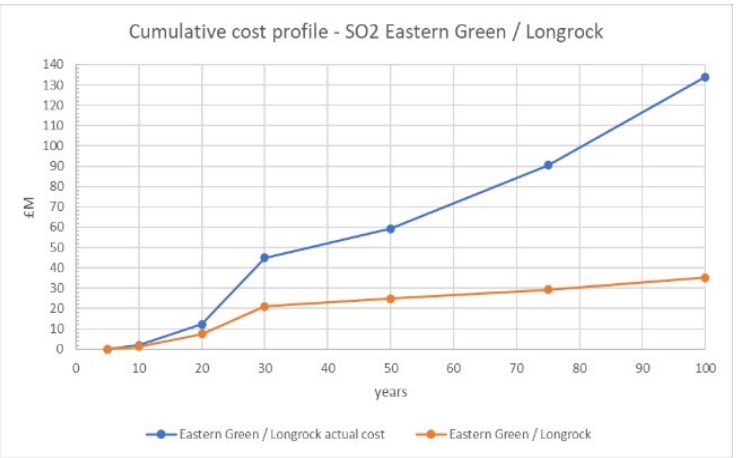


Figure 6-8. Eastern Green / Longrock cost profile SO2.

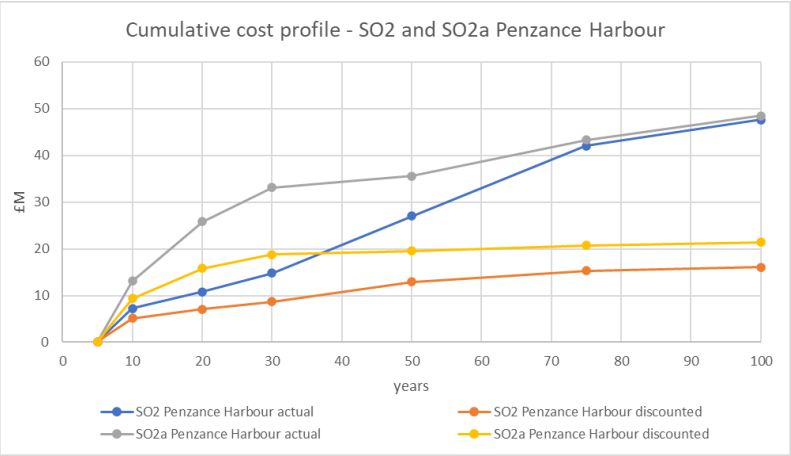
These costs are compared with the Do Nothing baseline in Table 6-3, demonstrating a strong economic benefit under this approach.

Table 6-3. Cost benefit analysis - Eastern Green / Longrock SO2

	Eastern Green / Longrock £M
Do Nothing PVd (Table 6-1)	172.7
Residual Damages (SO2)	0
Benefit (PVb)	172.7
Costs	35.2
Net Present value (NPV)	137.5
Benefit Cost Ratio (BCR)	4.91

While there may be some benefit associated with the modified approach to the northern end of Penzance Harbour (sub-option SO2a), this is relatively minimal under this linear approach to defence management.

Penzance Harbour (Figure 6-9)



Costs associated with the SO2 Strategic Management Approach for Penzance Harbour is estimated as being in the order of £40M (PVc £13.18M), including the cost of maintaining the main Harbour structures.

Modifying the approach to defence under Approach SO2a would incur significant initial actual costs, with reducing cash costs over the longer term (£35.9M) but increasing the discounted cost (PVC £15.11M).

Figure 6-9. Penzance Harbour cost profile SO2 and SO2a

These costs based on the primary Strategic Management Approach SO2 and the modified approach (SO2a) are compared with the Do Nothing baseline in Table 6-4, demonstrating a strong economic benefit under the primary SO2 Approach.

Table 6-4. Cost benefit analysis - Penzance Harbour

	Penzance Harbour SO2 £M	Penzance Harbour SO2a £M
Do Nothing PVd (Table 6-1)	28.53	28.53
Residual Damages (SO2)	0	0
Benefit (PVb)	28.53	28.53
Costs	13.18	15.11
Net Present value (NPV)	15.35	13.42
Benefit Cost Ratio (BCR)	2.16	1.89

It should be noted that the benefits associated with operation of the Harbour and the significant economic benefit Penzance Town as a whole have not been determined and are not included in the above table. Even excluding these additional benefits, it is demonstrated that there is substantial FCERM economic benefit from continued management.

The outline costs associated with Strategic Management Approach SO2a, indicate that modifying the approach to management could bring longer term benefits in terms of management of the area, while still maintaining a sensible overall benefit cost ratio. Under this approach, there is marginal overall benefit to adjacent frontages, as discussed below.

Promenade (Figure 6-10)

Costs associated with the primary Strategic Management Approach SO2 is estimated as being in the order of £73M (PVc £25.29M), over the Promenade area. Under SO2a Strategic Management Approach, the cost would be £62M (PVc £22.14M), a reduction of some £11.8M (PVc reduction £3.15M).

This reduction comes from the reduction in cost:

- Associated with the additional protection provided by modifying the approach to management of the Harbour as set out above (reducing the cost of protection to the eastern part of the Promenade by £0.79M PVc). This has to be offset by the additional cost associated with modifying defence of the Headland, estimated as being in the order of £3.1M PVc.
- The reduction in cost associated with allowing realignment of the Foster Bolitho Gardens, with a cost reduction of £2.4M PVc.

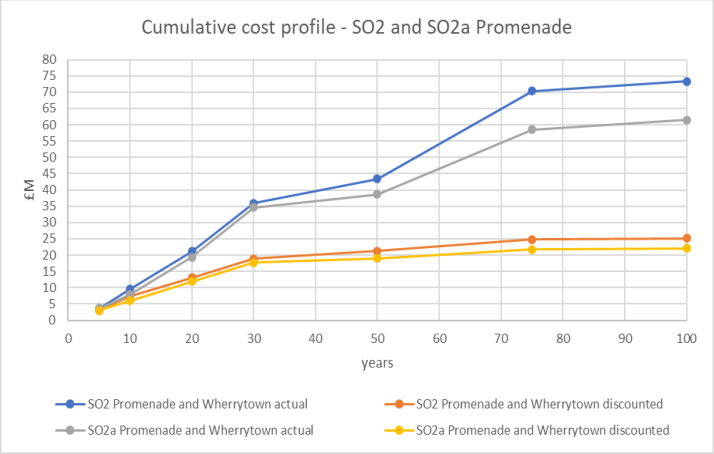


Figure 6-10. Promenade cost profile SO2 and SO2a.

In relation to this latter cost reduction, under Strategic Management Approach SO2a, it is taken that defences in the Foster Bolitho Gardens area would be allowed to fail, allowing the natural development of a beach in this area. Works would be undertaken in the future to protect the main road and property to the

rear of road. Some additional protection would be required to the end of the main Promenade alongside the need to manage the outfall of the Lariggan River.

Associated with this change to management (under SO2a) there would be some residual damage in relation to the Penlee Bowling Club and other recreational features, located within the Foster Bolitho Gardens). These residual damages amount to some £100k PVd.

The approach costs are compared to the Do Nothing damages (set out in Table 6-1) in Table 6-5, showing the overall comparison between SO2 and SO2a Strategic Management Approaches for the full Promenade frontage and more specifically in relation to management of the Foster Bolitho Gardens area.

Table 6-5. Cost benefit analysis - Promenade.

	SO2 £M	SO2a £M	Differential analysis of FBG MR area £M	
			SO2	SO2a (MR)
Do Nothing PVd (Table 6-1)	74.04	74.04	1.6 + 2.94 (road) = 4.5	
Residual Damages (SO2)	0	0.1	0	0.1
Benefit (PVb)	74.04	74.03	4.5	4.4
Costs	25.29	22.14	3.92	1.56
Net Present value (NPV)	48.75	51.89	0.58	2.84
Benefit Cost Ratio (BCR)	2.93	3.34	1.14	2.8

The Table does demonstrate that there is economic benefit in continued management of the Promenade frontage. However, Strategic Management Approach SO2a indicates significant economic benefit as compared to SO2, by capitalising on the realignment of the Foster Bolitho Gardens frontage. If the main Promenade frontage were defended but the FBG area was realigned, this would improve the benefit cost ratio from 2.93 to around 3.34. This highlights the weak economic case for continuing to defend the Foster Bolitho Gardens frontage.

In relation to management of the Promenade area under the general approach of sustaining existing defences, from an economic perspective:

- There is a good justification for sustaining the existing defences over the main Promenade area, but
- Little justification for sustaining the defence to the Foster Bolitho Gardens.
- While there would be some benefit in terms of reducing defence costs to the Promenade in modifying the approach to management at the Headland, this reduction in costs would not justify the additional cost associated with management of the Headland.

Newlyn (Figure 6-11)

Costs associated with the Strategic Management Approach SO2 over the whole Newlyn area is estimated as being in the order of £30.7M (PVc £11.1M). This includes costs associated with the current improvement works being investigated in relation to management around the entrance to the Newlyn Coombe River and improvements to fluvial flooding from further upstream within the valley.

Works also include the cost of maintaining the main Harbour structures.

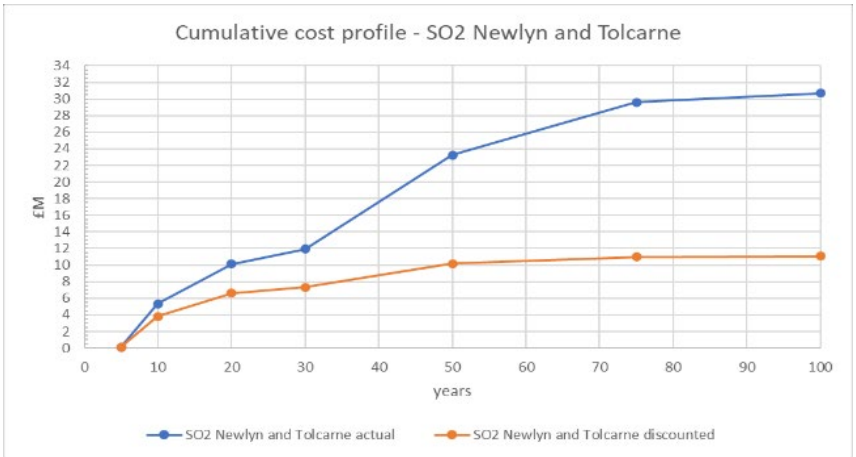


Figure 6-11. Newlyn and Tolcarne cost profile - SO2.

These costs are compared with the Do Nothing baseline in Table 6-6, demonstrating a strong economic benefit under this approach.

Table 6-6. Cost benefit analysis - Newlyn and Tolcarne

	Newlyn and Tolcarne £M
Do Nothing PVd (Table 6-1)	79.16
Residual Damages (SO2)	0
Benefit (PVb)	79.16
Costs	11.1
Net Present value (NPV)	68.06
Benefit Cost Ratio (BCR)	7.13

Mousehole and Coastal Road (Figure 6-12)

Costs associated with the Strategic Management Approach SO2 for this area is estimated as being in the order of £18.01M (PVc £4.62M).

The steeply increasing costs between Year 30 and Year 70 includes costs associated with sustaining the main Harbour structures, acting to protect the village, and sustaining the coastal road avoiding the need for major works to reroute access to the village.

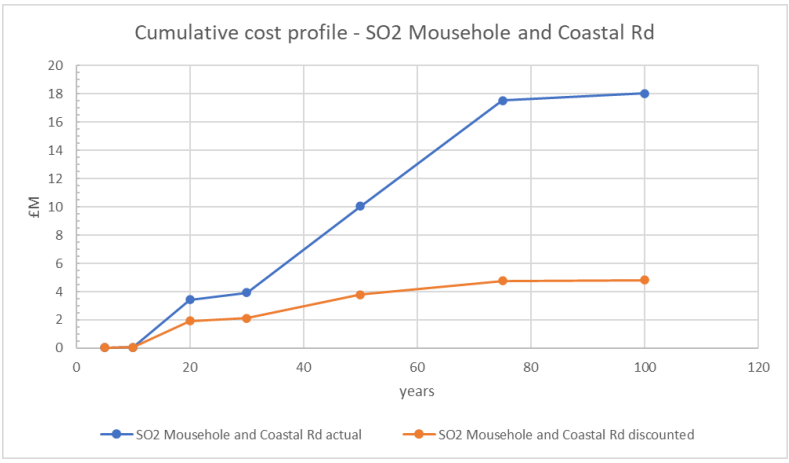


Figure 6-12. Mousehole and Coastal Road cost profile.

More immediate costs associated with resilience to property currently at risk from flooding are also included in the above values.

The overall costs are compared with the Do Nothing baseline in Table 6-7, demonstrating a strong economic benefit for continued management of the Mousehole area under this Approach.

Table 6-7. Benefit cost analysis - Mousehole and Coastal Road SO2.

	Mousehole and Coastal Rd. £M
Do Nothing PVd (Table 6-1)	28.92
Residual Damages (SO2)	0
Benefit (PVb)	28.92
Costs	4.62
Net Present value (NPV)	24.3
Benefit Cost Ratio (BCR)	6.26

Commercial

In general, the Strategic Management Approach SO2 is a perpetuation of current practice and, while, under the umbrella of an agreed Strategy Framework, certainly initially, the intent would be for works to be undertaken in a more planned manner, allowing less reactive approach to be adopted. To a significant degree, works would still be undertaken in response to storm events and more immediate changes in beach level.

As such, while the delivery of works would follow a traditional viable procurement route, there remains the concern that funding from various sources would still need to be developed in an ad hoc rather than fully planned manner. At present, funding has typically been driven by emergency funding following storms.

Financial

There is an on-going need for an integrated approach to funding, with key partners identified as being:

- Each of the main Harbour Authorities,
- Highway Authority
- Utility providers and
- Network Rail.

While the Strategic Management Approach SO2, delivers the basic requirement for defence, as identified in the strategic assessment, the approach offers little to compliment the opportunity for regeneration and Place Making. As such, while there might be some alternative sources of funding, this might realistically be limited to the partnership funding of the basic need to sustain the existing infrastructure.

A high level assessment of this has been made based on the current partnership funding calculator. The results of this are set out in Table 6-8.

Under the integrated approach being developed through the Strategy, costs in critical areas such as Penzance and Newlyn Harbour include the cost of maintaining the important third-party harbour structures. Along the Eastern Green / Longrock frontage there are significant third-party assets at risk, including sewerage and rail and road networks. There is, therefore, a realistic expectation that partnership funding would be available, although this would need to be discussed further as part of adopting and implementing any Strategic Management Approach.

Table 6-8. Indicative Partnership Funding

Area	Damages (PVd) £M	Cost (PVc) £M	BCR	PV max FCERM GiA £M	Raw PF Score	Potential Partnership funding deficit £M
Marazion Core	7.08	2.2	3.22	2.46	112%	-
Marazion West	4.3	4.7	0.98	0.32	-	4.4
Eastern Green / Longrock	172.7	35.2	4.9	14.3	41%	20.9
Penzance Harbour	28.5	13.2	2.2	6.9	52%	6.3
Promenade (SO2a FBG)	74.0	22.1	3.2	8.3	38%	13.8
Newlyn	79.2	11.1	7.1	6.4	58%	4.7
Mousehole	28.9	4.6	6.3	4.0	87%	0.6
Totals	**394.7**	**93.1**	**4.2**	**42.8**		**50.7**

The Promenade potentially poses a more difficult situation in that there is a significant level of partnership funding required, with Strategic Management Approach SO2 only offering a basic approach to defence, with more limited opportunity to attract third party investment. To a degree this re-emphasis the finding of the SMP in identifying the need for a different approach (considered below in Strategic Management Approach SO3).

6.1.2.4 Summary Discussion of Strategic Management Approach (SO2) and Sub-options

Strategic Management Approach SO2 delivers the basic risk management function, taking a linear approach to defence, reinforcing and, as necessary, raising the level of the existing defences.

Associated with this approach, particularly over the longer, more open frontages of Marazion West, Longrock and Eastern Green and the Promenade, would be the loss of beaches and lowering of the foreshore. This is reflected in the need to accept the loss of the Marazion Dunes, and the subsequent need to defend the road with set-back defences to the Marsh and the set-back flood defence to the western part of Marazion. It further results in the need to keep upgrading defences along other sections, a continuing and increasing need for major investment to sustain defences.

This has a severe impact on the visual and recreational use of the sea front and, while providing that basic requirement for defence, delivers little in terms reconnecting land and sea, offering little additional benefit in terms of land use.

While the economic FCERM justification in the area of Marazion Dunes needs to be considered within the broader picture of maintaining the integrity of Marazion Marsh and with respect to the risk to the railway line, overall the Strategic Management Approach SO2 is shown to have a benefit cost ratio (BCR) in the order of 4.2 (Table 6-8).

Under this general approach, there is some benefit in terms of costs associated with the Promenade in modifying the manner in which the Headland area is managed. However, this does not compensate for the additional cost (considered in the defence of Penzance Harbour) of this modified approach.

Consideration of Strategic Management Approach SO2a indicates that, while there is some benefit in retaining defences to the Foster Bolitho Gardens area, the economic case is relatively weak. In testing this, it is demonstrated that that the SO2a approach would make sense economically and, as such, it is concluded that managed realignment in this area should be taken forward.

Overall, and taking account of the change at the western end of the Promenade, there is a good economic argument for continued defence to the overall area. Despite this there would be the need for significant partnership funding to deliver this strategic approach. It is reasonable to assume at this stage that partnership funding could be available over key areas, including the core of Marazion, Eastern Green / Longrock, Penzance Harbour, Newlyn and the coast road to Mousehole.

Partnership funding in the area of Marazion Marsh and the Marazion Dunes, considered in isolation may be more complex but to a degree this has to be seen within the context of maintaining the integrity of the marsh and sustaining the full length of the railway line.

Along the Promenade, while the option does sustain the basic required level of protection, supporting the basic structure for regeneration, the option provides little complimentary opportunity for delivery of the aims and aspirations of the Neighbourhood Plan. As such, the opportunity for partnership funding may be limited.

The analysis and discussion presented above highlights:

- The need and benefit for continued management across the wider area.
- There are constraints and barriers imposed by the Strategic Management Approach SO2 with respect to a more integrated management of the area.

Specifically, under this Strategic Management Approach SO2:

- Maintaining defence to the core part of Marazion is sensible and deliverable.
- Maintaining and improving defence to the Eastern Green / Longrock frontage is deliverable but with severe consequences on the use of the area, such that as a long term approach there is little flexibility and that, once started, this approach would constrain more adaptive approaches to the uncertainty associated with climate change and sea level rise.
- Maintaining and improving defence to the Penzance Harbour critically depends on the main Harbour structures, but logically assuming the continued need to sustain the use of the Harbour, the approach offers a sustainable and affordable approach to defence.
- Specifically, under this approach, there seems little benefit from modifying the form of defence at the interface between the Harbour defence and that of Eastern Green.
- There is, however, slightly better justification to taking a modified approach at the Headland, potentially offering benefit to the way in which the eastern end of the promenade is then managed.
- Continued defence of the Promenade area is economically justified but limits the opportunity for partnership funding.
- In considering management of the Foster Bolitho Gardens area, the preferred management approach would be for managed realignment, maintaining the defence of the road and property, but allowing the development of a more natural area of beach, although still reliant upon a setback linear defence over the longer term.
- Maintaining and improving defence to the Newlyn Harbour critically depends on the main Harbour structures, but logically assuming the continued need to sustain the use of the Harbour, the approach offers a sustainable and affordable approach to defence. (The justification for defence to Tolcarne is considered later under Strategic Management Approach SO3.)
- Continued defence of the coastal road access to and the main area of Mousehole is sensible and considered deliverable and sustainable.

Overall, as discussed in 6.1.2.2, the approach fails to deliver the ability to adapt, imposing a very fixed approach to management, closing down opportunity for change and failing to address many of the challenges posed by climate change. Not least, in this, is the increasing impact this Strategic Management Approach So2 would have on the natural environment and the integration with broader values.

This is reflected in Figure 6-13 (based on the assessment shown in Figure 6-5 but showing the balance between different aspects (Economy, Health and Security, Nature and FCERM) set out in the strategic outcomes.

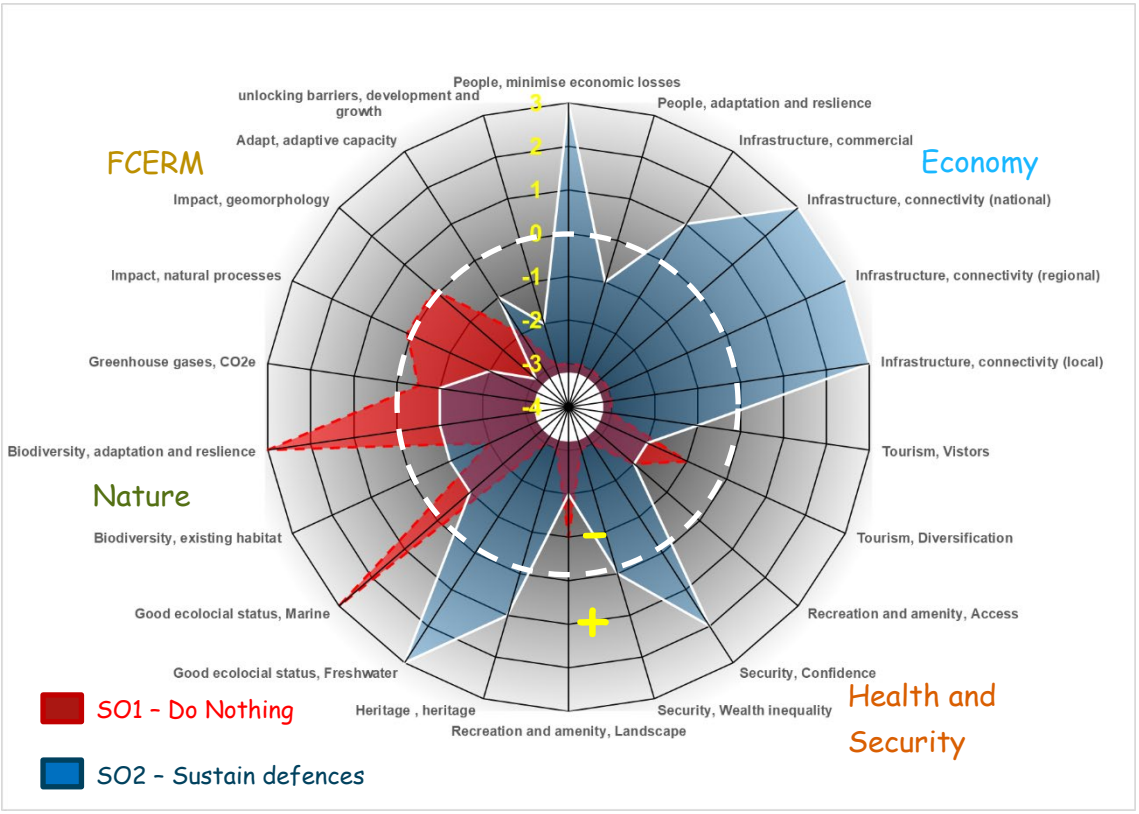


Figure 6-13. Overview assessment of SO2 - Sustain Existing Defences.

In comparison to SO1 – Do Nothing, this Strategic Management Approach SO2 shifts the emphasis of management solely towards the delivery of primary economic factors but without sustaining or improving the broader coastal environment underpinning the use and value of the coast. Although considered as a further baseline, this approach is not considered to deliver an appropriate framework for management.

This, as shown in Figure 6-4, the main areas of conflict arise across the Longrock / Eastern Green frontage and in relation to the Promenade. These findings are taken forward in considering alternative Strategic Management Approaches, with Approach SO3 seeking to examine an alternative more adaptive approach at Eastern Green / Longrock (with consideration of how this impacts the western section of Marazion) and along the Promenade.

6.1.3 Strategic Management Approach SO3 - Controlled Adaptation

6.1.3.1 Description and Assessment of Option and sub-options

The main focus under Strategic Management Approach SO3 is around the areas of The Promenade and Longrock / Eastern Green. In both areas the intent is to increase the width of management, considering the use of nearshore breakwaters in combination with shore connected structures and specific areas of sediment recharge. Ultimately the approach still maintains protection to the overall area, to the same basic standard of protection offered by Strategic Management Approach SO2.

The approach takes forward the need to sustain existing defences at Mousehole, Newlyn, Penzance Harbour and to the core to Marazion. Under this approach, however, sustaining existing supply of sediment from the Eastern Green / Longrock frontage through local sediment recharge opens up the potential to maintain the Marazion Dunes and sustain defence to the west of Marazion.

As part of the primary Strategic Management Approach SO3, it is initially assumed that defences to Penzance Harbour would be modified (i.e. introducing local breakwaters) at the interface between Penzance and Eastern Green and at the Headland, interfacing with the more adaptive approach being considered for the Promenade.

The benefit of this is tested in Sub-option SO3a, reverting to the linear approach to management across the Penzance Harbour area. Sub-Option SO3a also allows consideration of managed realignment along the Tolcarne frontage and consideration of allowing the more natural development of the shoreline to the west of Marazion. These local adjustments are to a degree separate from each other.

One further sub-option is considered with respect to the west of Marazion changing from either sustaining defences in this area (Strategic Management Approach SO3) or allowing natural progression (sub-option SO3a) to a managed approach to realignment (sub-option SO3b). The Option and sub-options are set out in Figure 6-14.

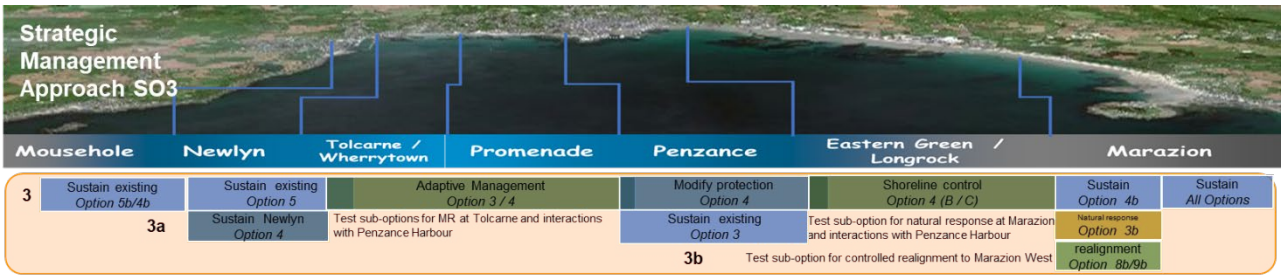


Figure 6-14. Strategic Management Approach SO3.

6.1.3.2 Overview of constraints and opportunities

In sustaining the basic defence structure to the Harbours and maintaining access to Mousehole along the coastal road, this maintains the opportunity for development and regeneration within these areas.

Within the area of the Promenade, the Strategic Management Approach SO3 considers how breakwaters could be used to create a more varied approach to defence, allowing the opportunity for defence to be integrated within the aspirations for Place Shaping, in line with ideas emerging from the Neighbourhood Plan.

Clearly, this does give free range to how such opportunities might be developed, in that there remains the need to address the FCERM risk. However, the approach creates the opportunity to develop some areas

of wider upper beach; reduces the need the raise defences over the whole area; and creates the opportunity to create better access to the foreshore.

The outline configuration of structures, shown in Figure 5-10 provides an initial concept design which might be modified in discussion with the community to allow the detailed design of an integrated approach.

In developing this, the overall approach would not preclude further future consideration of opening the Lariggan River valley, providing further opportunity to move away from a very fixed approach to defence. In addition, by potentially extending the breakwater approach across the Foster Bolitho Garden area, the opportunity is created to provide wider areas of upper beach, limiting the need for a setback hard defence line and allowing a more natural transition between the open space and the foreshore. As part of this, there may be better scope to retain certain fixed features within the open space of Foster Bolitho Gardens, allowing more of a community led approach to detailed design.

The use of breakwaters softens the interaction between the wave energy and the fixed defence line reducing the impact on the nearshore area, while also potentially, through the use of submerged structures, reducing the visual impact and creating opportunity for habitat creation.

These opportunities, in part developed as an important aspect of the overall Approach SO3 and in part allowing further development as the strategic framework is developed, are highlighted in Figure 6-15.

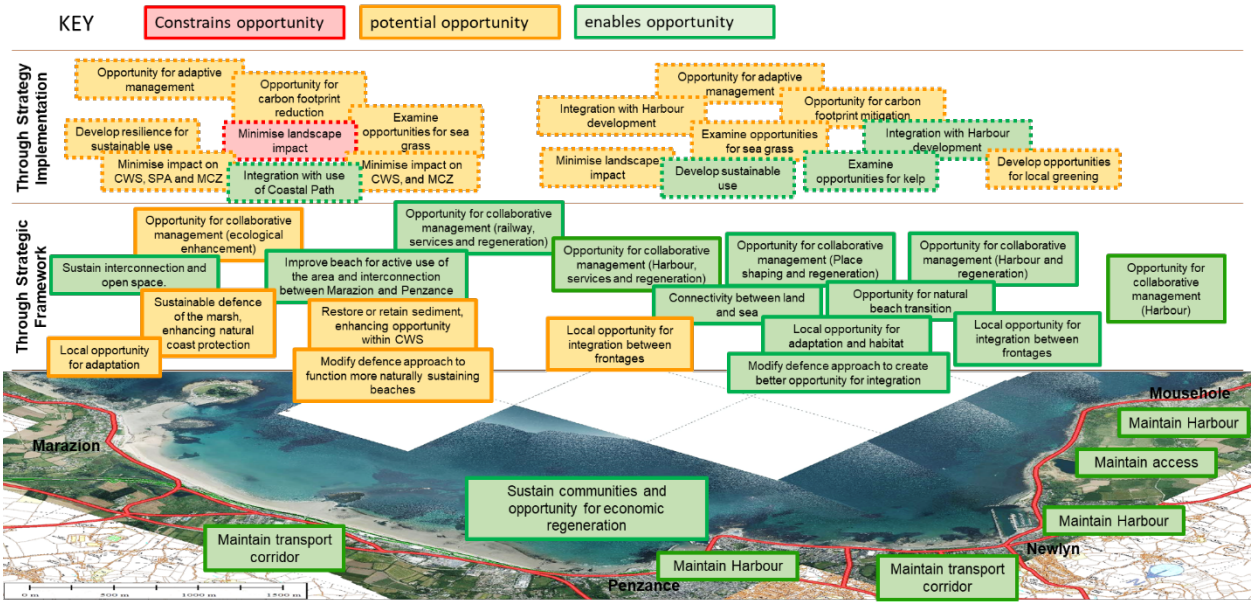


Figure 6-15. Opportunities and constraints associated with SO3 – Controlled Adaptation.

While mitigating some of the constraints associated with SO2 (Sustain Existing Defences, Figure 6-4) over the Eastern Green / Longrock frontage, the use of breakwaters in this area does impose significant control over the natural development of the area. This is shown in Figure 6-15, highlighting that, while the opportunity is created for sustaining and enhancing the beaches, the beach use and the development of the County Wildlife Site, this would need to be developed further through the design of the approach.

While this approach potentially creates this more natural functioning shoreline, this would tend to create more discrete areas of wider beach, where sediment is retained by structures. This influence would be more marked were larger fishtail breakwaters are to be used (Figure 5-4b) compared to an alternative option (Figure 5-4c) where there is a combination of smaller fishtails and nearshore breakwaters. In either

configuration an essential aspect of the approach would be the need to maintain a degree of sediment supply feeding to the east, to support the existing basic supply to the Marazion Dunes and to the western part of Marazion. This increases, to a degree, the consideration of a wider range of approaches to management of the Marazion area, allowing consideration of:

- Sustaining existing defences (possibly over the short to medium term) as shown in Figure 5-2 (local option 4b),
- Adopting a more fully adaptive approach, Figure 5-4 (local option 3b), or
- Local options 8b or 9b for setback and controlled realignment (Figure 5-3).

As such the overall Strategic Management Approach SO3 does provide greater opportunity for managing change and adaptation across the whole of the eastern end of the Strategy area.

Adaptative Capacity

Given the existing condition of defences and the short term need for improving the resilience of defences, under this Strategic Management Approach SO3 there would be a requirement for significant early investment, specifically over the Promenade and Eastern Green / Longrock frontages, establishing the framework for future management.

However, even in developing in detail the configuration of the main control structures, this Approach allows significantly greater opportunity for integration with other emerging plans for these areas. In terms of the Promenade, this would look to develop upon the general concept design, allowing the design and positioning of structures to be developed alongside the aspirations set out through the Neighbourhood Plan with the community.

Over the longer term, and while safeguarding existing aspects of the frontage, such as the Jubilee Pool and the open aspect of the Promenade, the basic Strategic Management Approach SO3 would not constrain the potential opportunities for opening the Lariggan valley to increased tidal influence or a more adaptive approach to management of the open area of the Foster Bolitho Gardens.

In effect, the Strategic Management Approach SO3, while providing a strong physical structure for flood and coastal erosion management, would enhance the capacity for greater adaptation both in relation to the more immediate works and the longer term management of the frontage. Critically, in providing a clear way forward, this enables opportunity for developing collaborative funding.

In relation to the Eastern Green / Longrock area, this SO3 Approach, does allow some degree of flexibility in terms of the form and position of the main control structures, with the potential, therefore, for works to be developed in an integrated manner alongside consideration of use of the area. In addition, it would be proposed that the works would be staged in their construction. Specifically, works over the Eastern Green area would be constructed first, with some scope for the second stage of works to be delayed or modified in response to the actual risk and performance over the Longrock area.

However, notwithstanding this degree of subsequent modification of the Strategic Management Approach as set out in this document, the Approach does necessarily establish a strong control over the beach, with the main protection still being reliant upon the existing linear flood defences. As such, with the main structures being designed typically with a life of some 100 years (accepting the need to maintain and improve over their life), the decision to progress this Approach offers very little scope for subsequent adaptation in the future.

The benefit of this is that this provides confidence in developing planned collaborative funding, but that works undertaken in the short term will determine the approach to defence over the longer term.

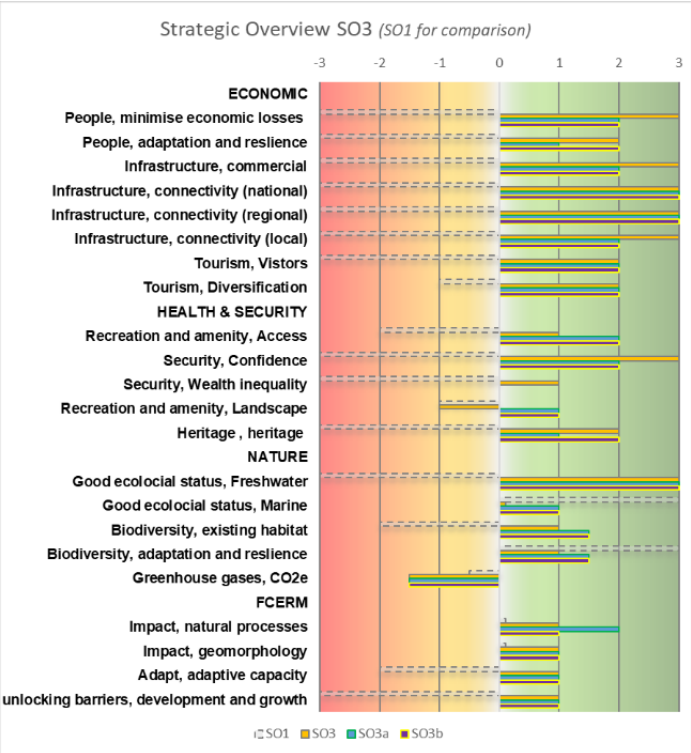
In effect, this is similar to the situation in the areas around the Harbours, that while there is still scope for some local adaptation in detail, the Strategic Management Approach So3 aims to provide a clear pathway with the intent to sustain the use of the Harbours and protection to the essential hinterland use, providing confidence in planning future investment.

At Marazion, there is limited scope for adaptation to the main part of the Town. However, the approach to management, in maintaining a basic level of sediment supply, opens up the opportunity to consider more adaptive approaches to management of the Marazion Dunes, the Marazion Marsh and the western part of the Town. There are constraints on this, in that, over the medium to long term there would still be pressure on the Dunes and, in attempting to sustain existing defences to the western part of Marazion, there would be the need to raise and reinforce defences.

Even so, the overall Approach does create the opportunity to consider more adaptive options.

Strategic summary

A detailed assessment of this SO3 option is considered through the SEA being undertaken in combination with the development of the Strategy. Within this section of the report an overview is provided based on the Strategy objectives (Section 2.4) and set out in line with the core aims related to the Cornwall Environmental Growth Policy (economic, health and security and the natural environment) and incorporating critical aspects of Defra's policy statement, as discussed in Section 2 of this report.



This overview is presented in Figure 6-16.

The Approach delivers against the overall FCERM economic indicators, in terms of substantially reducing the risk of loss of property, transport and supporting existing economic development. From the preliminary analysis with respect to carbon footprint (Appendix E), it is indicatively shown that the use of large nearshore rock structures, particularly over the Eastern Green / Longrock frontage, does come with an increased carbon impact over the time period of the strategy when compared to Strategic Management Approach option SO2.

The more strategic benefit, compared to Approach SO2, however, is in relation to the interaction with land use and potential mitigation of impacts on the natural foreshore.

Figure 6-16. Strategic Summary for SO3 (SO3a and SO3b)

In this, while still having a significant impact on the visual landscape, the SO3 Approach delivers better, through using width within the natural coastal system, with respect to access to the foreshore and enjoyment of the natural environment and integration of the land and sea.

The overall approach works more with natural processes of the shore and through the use of sediment recharge maintains the supply of sediment along the shore, in particular in maintaining a basic supply of sediment from the west to the Marazion area.

The approach does incur the need for more major works during the earlier period considered by the Strategy. However, this does establish a basic and very visual framework for defence into the future, without necessarily fully constraining further adaptation over the longer term. From this, the approach might be considered to engender greater confidence in terms of FCERM, compared to the more reactive or responsive approach developed in Strategic Management Approach SO2.

Notwithstanding the clear need under this Approach for major works and investment, the Approach is considered to deliver better against the Strategic Objectives than either Do Nothing or SO2. Importantly, the approach aims to address the fundamental issues identified by the SMP in terms of long term sustainability and in adapting to the increasing coastal pressure due to sea level rise.

The sub-options consider the potential impacts and opportunities for furthering this more adaptive approach in local areas, balancing this through the consideration of cost and benefits that might arise.

6.1.3.3 Economic, Commercial, Financial and Management Assessment

Economic Assessment

Damages.

At the strategic level it is taken that defence would be improved to provide sustainable use of the area, providing an appropriate high standard of protection. As such it is assumed that there would be no residual damages (except in areas specifically considered by the sub-options). This assumption would need to be tested in developing schemes in specific areas but provides a sensible consistent strategic baseline for assessing different Strategic Management Approaches.

The benefits of continuing to provide this standard of defence derive from the avoidance of damages set out in Table 6-1, with a total overall PVc benefit of £395M.

Costs and Cost Profile.

The cost of this Approach is built up from an assessment of actions required for each defence area over the full 100 year period of the Strategy, allowing consideration of more specific local areas. The overall results of this assessment are presented in Figure 6-17 for the whole area.

The figure shows an overall cash cost of Strategic Management Approach SO3 in the order of £283M, with a Present Value cost (PVc) of £111M. The two sub-options vary slightly from this with very little change with respect to sub-option SO3b and slightly greater variation associated with sub-option SO3a. This reflects the potential choice to realign over the Tolcarne frontage. Consideration of these sub-options is discussed later.

In comparison with Strategic Management Approach SO2, Figure 6-17 indicates a significantly different cost profile, reflecting the need for major works at an earlier stage under Strategic Management Approach SO3. However, and reinforcing the point made in the strategic assessment, Strategic Management Approach SO2 results in an increasing cost into the future. This difference in profile is similarly shown in the assessment of the carbon footprint set out in Appendix E.

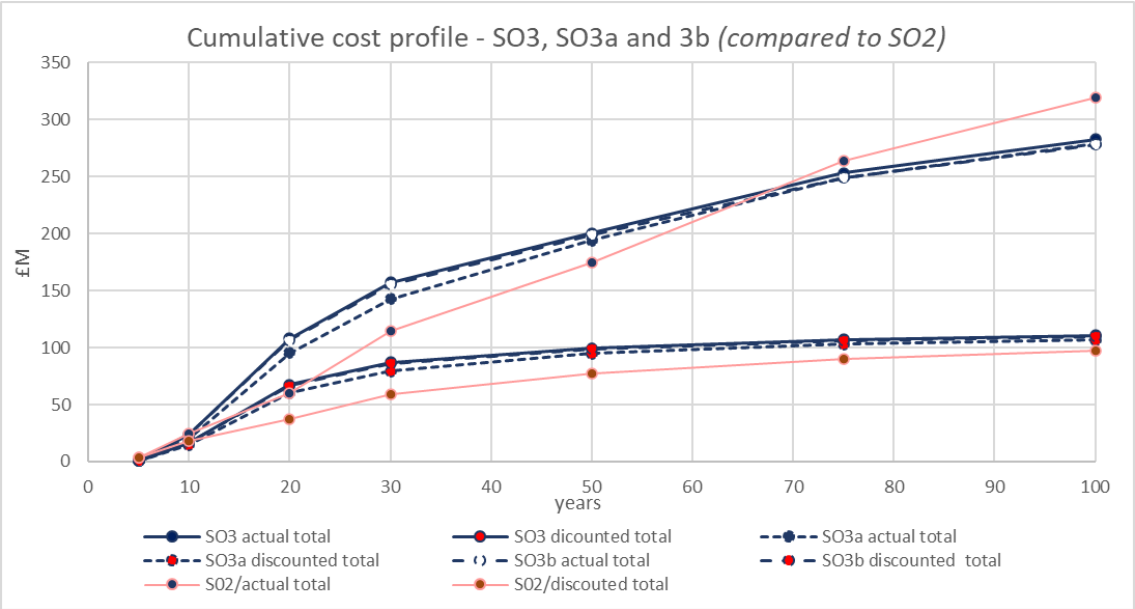


Figure 6-17. Cumulative Cost Profile approaches SO3, SO3a and 3b

The build-up of the overall cost profile is discussed in relation to individual areas below.

Marazion

The core element of the Marazion Town would continue to be defended with a cost in the order of £7.6M (PVc £2.2M) as discussed previously (Section 6.1.2.3 for SO2).

For the more critical area including the low-lying western part of the Town, the Dunes and the Marsh different sub-options are considered (defined in Figures 5-2 and 5-3 – Section 5.1.1).

Under the primary Strategic Management Approach SO3 (local approach 4b in Figure 5-2), this would involve sustaining the existing defence in front of the car park, while relying on the additional sediment supply sustaining the existing dunes, at least in part. Some works would still be required over later years to sustain the coastal road and there would be a need to raise the embankment within the area of the Marsh. The cost of this would be in the order of £10.94M (PVc £2.92M) as indicated in Figure 6-18.

Under the Strategic Management Approach SO3a, the aim would be to allow the shoreline to respond naturally over the main western Marazion frontages, providing resilience measures to property to the Town and within the Red River valley, while improving defences internally to the Marsh and providing some longer term protection to the road. The cost of this would be in the order of £8.84M (PVc £2.32M).

Figure 6-18. Defence cost profile for Marazion West - SO3, 3a and 3b.
(This plot shows costs associated solely with Marazion West and the Dunes. The costs associated with the core part of Marazion are as Strategic Management Approach SO2).

Under the final sub-option SO3b, while allowing the shoreline to respond more naturally, control structures would be constructed to limit erosion and retain sediment. In addition, set back defences would be put in place, reducing the need for works within the Marsh and within the valley further inland. The cost of this would be in the order of £6.85M (PVc £1.84M).

There would be some damages under sub-options SO3a and SO3b, typically in the order of £0.27M, with a PVd for option SO3 of around £4.3M and for SO3a and SO3b of around £4.0M.

For comparison, in Figure 6-18, the costs determined for the Strategic Management Approach SO2 are shown, highlighting the significant benefit created locally through the maintenance of the sediment supply to the area provided by Strategic Management Approach SO3, bringing the cost for defence (under SO3) down to a level that might be economically justified by local damages avoided.

Economically, managed realignment to the frontage would be the preferred approach, with an indicative BCR of around 2.2, however, such an approach would need to be developed in detail with the involvement of local landowners, coastal users and the community.

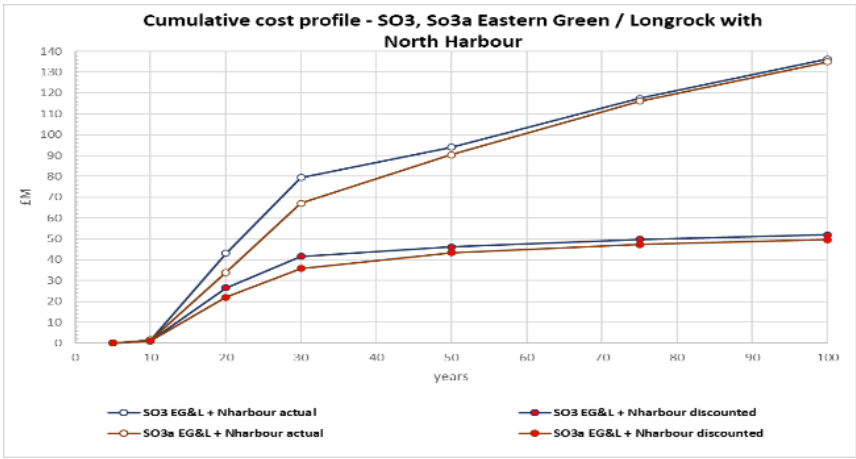
Eastern Green / Longrock

The Strategic Management Approach SO3 assumes that breakwaters and control structures constructed in phases across the area. Associated with these structures would be the need for sediment recharge and that the basic linear defence approach to Penzance Harbour area would be modified to include smaller breakwaters associated with the Chyandour area.

Under sub-option SO3a, it is assumed that management between the two areas (Penzance Harbour and Eastern Green) is separate, with the main breakwaters extending solely to provide defence to the Eastern Green area.

In comparing costs, therefore, these two options are considered to include the cost for the Eastern Green / Longrock area alongside those costs associated with the northern part of the Harbour. This is compared in Figure 6-19.

Despite the additional cost associated with modifying the area to the north of the Harbour and the earlier investment in the local breakwaters, this is balanced to a significant degree when combined with the management of the Eastern Green frontage under Option SO3.



At a strategic level this variation in management approach in this area cannot be ruled out and offers an alternative to be considered at a more detailed stage.

Figure 6-19. Cost profile comparison of local management in the Chyandour area.

The overall cost of Strategic Management Approach SO3a for the Eastern Green / Longrock frontage is set out in Figure 6-20, compared for reference to the cost for linear defence (SO2). The actual cost is in the order of £121.3M (PVc 47.37M).

The figure shows the high initial cost as the major structures are constructed, with the need for on-going sediment renourishment at regular intervals over the 100-year timeframe.

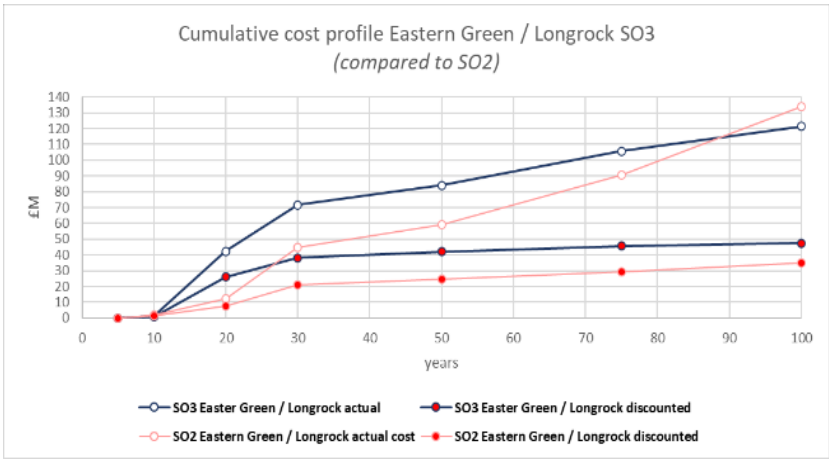


Figure 6-20. SO3 Cost profile comparison for Eastern Green / Longrock.

The figure also highlights how establishing a more fundamental control approach tends to reduce the need for on-going management and lower associated future costs (compared to a strictly linear approach – SO2). The underlying structure applied to management offers greater flexibility in the future in dealing with the uncertainty of the rate of sea level rise, such that, moving beyond the 100 years, that basic structural approach remains, creating a different physical environment within which future decisions may be made (i.e. the breakwaters control and continue to limit change, while the linear approach is more "all or nothing" as sections of linear defence become unsustainable over the longer term).

This adaptive control approach, however, comes with significantly greater discounted cost.

Penzance Harbour.

Notwithstanding the potentially greater economic justification for modifying the approach to defence at the northern end (discussed above) and at the interface with the management the Promenade, the approach to management of the Harbour is similar to that set out in Section 6.1.2.1 – Strategic Management Approach SO2.

The estimated cost of management is in the order of £39.98M (PVc £13.18M).

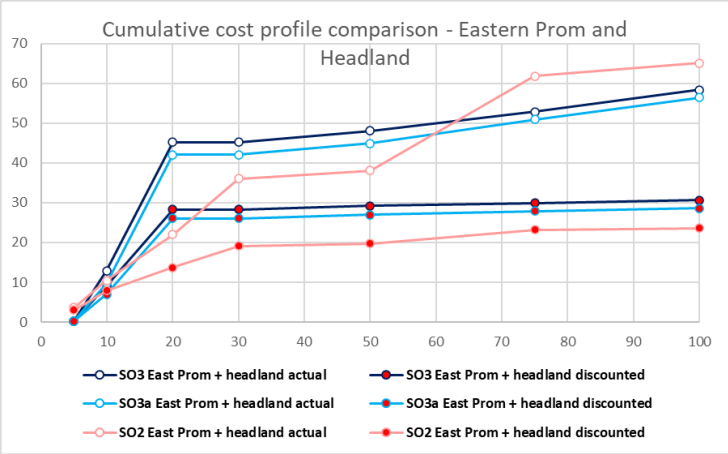
Promenade

Under this Strategic Management Approach SO3, the intent of the approach is to relax the focus on the existing defence line, creating greater width over which the shoreline system is managed.

Initial consideration is given to how a modified approach to management of the southern section of the Harbour (in the area of the Headland) may interface with the construction of nearshore breakwaters across the Promenade area. In effect the breakwater (BW1), shown earlier in Figure 5-10, extending west from the Headland, would be extended further, providing additional protection to the Promenade and linking through to the defence provided by the submerged reef.

Figure 6-21 shows a comparison of costs (over the eastern part of the Promenade and southern part of the Harbour) assuming, under approach SO3, defences are modified at the Headland and under approach SO3a where a linear approach is taken around the Headland area.

The figure shows that, in combination with construction of breakwaters across the promenade area, it remains more cost effective to manage the Headland without modification. The difference is such that, in detail design, the modified approach may still be beneficial (especially if this delivered a more acceptable option).

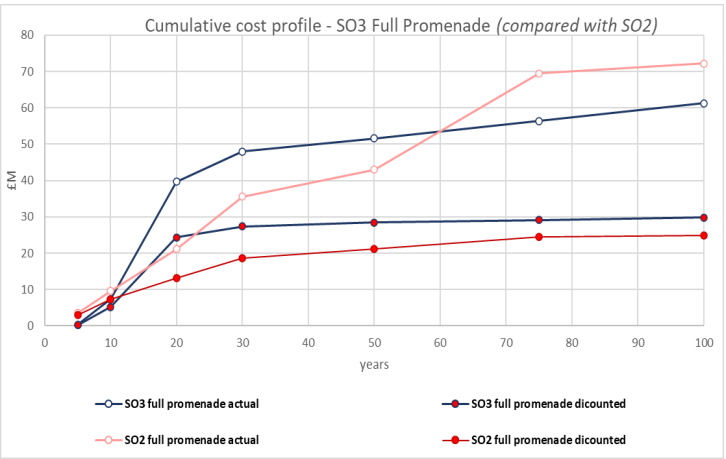


The overall approach delivers a significant reduction in actual cost compared to Strategic Management approach SO2, although recognising the need for increased earlier investment gives a higher discounted cost.

Figure 6-21. Cost profile comparison of management at the Headland.

This needs to be considered alongside management over the full area of the Promenade. The cost profile for the full frontage is set out in Figure 6-22.

The overall cost of Strategic Management Approach SO3 is in the order of £61.3M (PVc £29.8M). This is compared to Strategic Management Approach SO2, with an actual cost of £72.2M (PVc £24.5M).



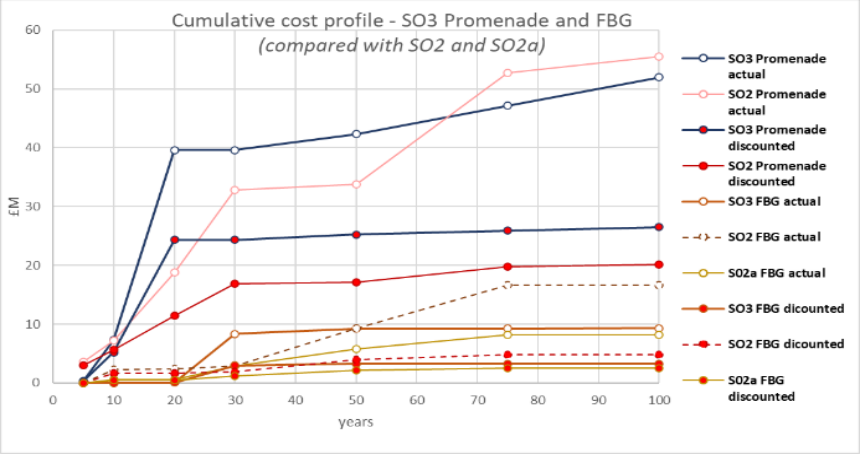
Again, the actual cost over the Strategy period is significantly less in providing a more adaptable approach to management, but with a higher discounted cost, due to the need for earlier investment.

This clearly makes the option very sensitive to when works might actually be undertaken. Either a delay in construction of the major structures by five years (or the need to undertake increased investment in linear defence earlier) would achieve PVc parity between these options.

Figure 6-22. Cumulative cost profile SO3 - Penzance Promenade.

Investigating this further, Figure 6-23 shows a comparison of costs between management of the main Promenade area and that associated with the Foster Bolitho Gardens area.

This Figure shows that the main difference in the cost profile, comparing SO3 and SO2 is associated with the management of the main Promenade, due to the construction of the main nearshore structures.



Over the Foster Bolitho Gardens area, construction of the local submerged breakwaters, provides a greater degree of control over the shoreline. This is compared to merely allowing the frontage to adjust, initially, in a fully natural response (SO2a). Option SO3 is marginally more costly (PVc_{SO3} £3.28M compared to PVc_{SO2a} £2.47).

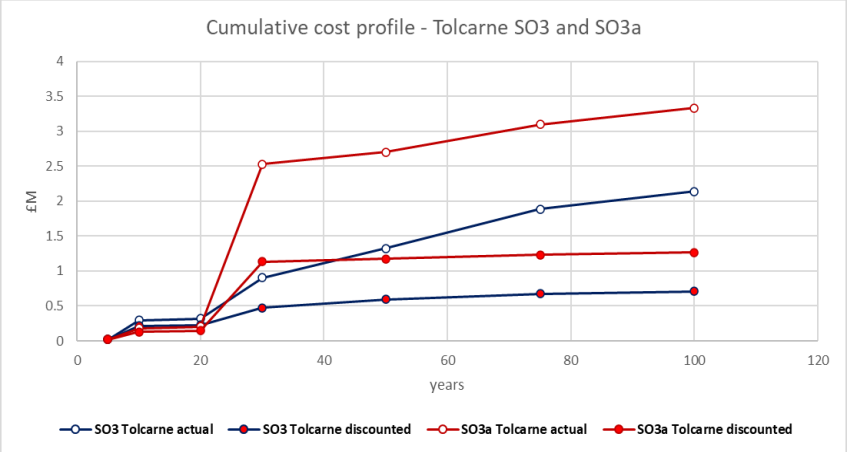
Figure 6-23. Cumulative cost profile breakdown over the Promenade.

The adaptive Strategic Management Approach (SO3) does provide a significantly more effective approach, creating opportunity for collaborative funding as compared to continued management of the existing defences (SO2).

Newlyn and Tolcarne

Under the primary Strategic Management Approach SO3, the sub-option SO3a considers the potential economic case for managed realignment of the Tolcarne area. The cost profiles for continued management (SO3) and for realignment (SO3a) are shown in Figure 6-24.

The figure shows that the additional cost of constructing new defences on a setback line (SO3a) would be substantially more costly compared to sustaining the existing defence (SO3).



While setting back defences might allow some adjustment to made to the entrance to the Newlyn Coombe River, this would come with significant additional cost and substantial increase in damages.

It may be concluded that continued defence of Tolcarne offers the preferred approach to management.

Figure 6-24. Cumulative cost profile comparison for Tolcarne

Strategic Management Approach SO3 is the same as that for SO2 for the rest of the Newlyn area.

Mousehole and Coastal Road

The Strategic Management Approach SO3 for this area is the same as for SO2, discussed earlier.

The overall conclusions of the above economic assessment in terms of how management would be delivered across the whole area under Strategic Management Approach SO3, is shown in Figure 6-25.

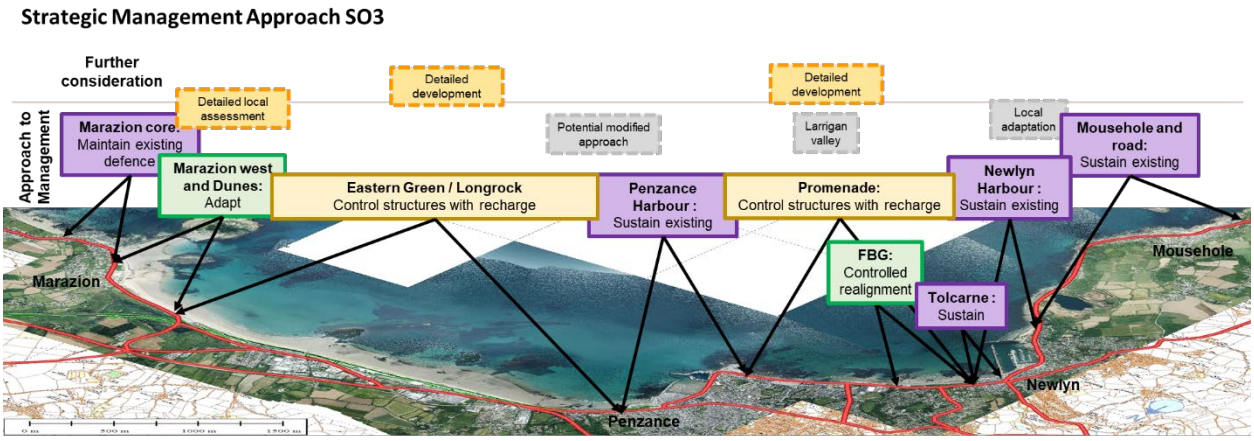


Figure 6-25. Integration of local application of Strategic Management Approach SO3.

Table 6-9 summarises the economic case for this Strategic Management Approach, highlighting how different sub-options have been incorporated within the overall Strategic Management Approach SO3. The Table also provides a comparison of benefit cost ratios for each area compared to Strategic Management Approach SO2.

Table 6-9. Summary of economic assessment for SO3

Location	Approach or sub-option	Do Nothing PVd (£M)	PV Residual Damages (£M)	Benefits PVb (£M)	Costs PVc (£M)	Net Present Value NPV (£M)	Benefit Cots Ratio BCR	BCR Comparison SO2
Marazion Core	Option SO3	7.08	0	7.08	2.2	4.88	3.22	*3.22*
Marazion west and Dunes	Option SO3b	4.27	0.27	4.0	1.84	2.16	2.17	*0.85*
Eastern Green / Longrock	Option SO3a	172.7	0	172.7	47.37	125.3	3.65	*4.19*
Penzance Harbour	Option SO3	28.53	0	28.53	13.18	15.35	2.16	*2.16*
Promenade	Option SO3a	74.04	0.1	73.94	29.9	44.04	2.47	*3.34*
Newlyn and Tolcarne	Option SO3	79.16	0	79.16	11.1	68.06	7.13	*7.13*
Mousehole and Coastal Rd.	Option S03	28.92	0	28.92	4.62	24.3	6.26	*6.26*
	Total	**394.70**	**0.37**	**394.33**	**110.21**	**284.09**	**3.58**	*4.23*

The Strategic Management Approach SO3 is demonstrated to be economically justified both overall and in relation to all individual areas.

Commercial

The Strategic Management Approach SO3, with selected elements of sub-options (as identified in Table 6-9) aims to sustain existing defences in areas such as Marazion (core), Penzance Harbour and Newlyn (including Tolcarne) and to Mousehole and the coastal road. To a degree, in these areas this would perpetuate current management, critically in areas where there is already a relatively planned approach. Certainly, within the two large Harbour areas this planning is as part of ongoing management of the operation of the Harbours.

As such, the delivery of works in these areas would follow a traditional viable procurement route. In the case of the core part of Marazion, this would typically be driven by deterioration or reducing standard of protection of defences but within the expectation, driven by the Strategy, that works would be required. With respect to Mousehole and the coastal road, to a degree, at present the lack of a coherent strategic approach has meant that a rather *ad hoc* approach has been taken. Within the context of the Strategy a more planned approach would be developed.

With respect to the two large frontages of Eastern Green / Longrock and the Promenade, this Strategic Management Approach, SO3, if adopted, would provide an agreed overall approach setting a clear framework and intent. As such, and with the intent to construct major strategic control structures, the development of specific schemes would be planned allowing development of a short to medium term procurement route.

Financial

There is an on-going need for an integrated approach to funding, with key partners being identified as being:

- Each of the main Harbour Authorities,
- Highways Authority,
- Utility providers and
- Network Rail.

The broader scale approach defined by Strategic Management Approach SO3, provides a strong framework for investment, with major works being required over the short to medium term. This far clearer approach for significant investment would allow a stronger pathway for the potential partnership organisations to seek appropriate funding and develop a coherent subsequent funding plan. This compares favourably to the more piecemeal approach offered by Strategic Management Approach SO2. From this perspective Approach SO3 has the potential to develop a more secure funding programme.

The more adaptive approach defined by Strategic Management Approach SO3 offers significantly greater opportunity and flexibility in detail, to integrate with broader level plans and aspirations for coastal management, also offering greater opportunity to improve the connection between land and sea. As such, the approach has the potential to be developed alongside and complimenting efforts for regeneration, with greater opportunity for partnership funding linked to Cornwall's Environmental Growth policy and directly to plans for Place Shaping.

However, the higher costs over the initial 10 to 20 years does raises a challenge in terms of programming the required funding. Developing this within a clear strategic approach will ensure that opportunities can be maximised in a coherent manner.

Despite the increased cost in some areas, there is a realistic and enhanced opportunity for significant additional partnership funding.

6.1.3.4 Summary Discussion of Option and Sub-options

Strategic Management Approach SO3 delivers the basic risk management function, taking an approach more sensitive to the aim to reconnect Penzance and the broader area with the shore. In particular the approach maintains a degree of flexibility for adaptation of risk management in an integrated manner alongside opportunity for regeneration and enjoyment of the coastal environment.

Along the important Eastern Green / Longrock frontage, linking through to Marazion, the approach enhances the potential development of the Coast Path as a destination, over and above its function as a

coastal route. This is further supported through to creation of local upper beach areas, sustaining the foreshore through sediment recharge.

With the additional sediment supply, this creates potential different options for management over the western part of Marazion. Examining this further under the primary SO3 Approach shows that while maintaining existing defences becomes an option, there would be the need still to raise the defence in the medium term, increasing over the longer term, with associated loss of beach. Alternative sub-options have therefore been considered. SO3a considers the option to allow the coast to respond in a fully natural manner and SO3b considering how the shoreline behaviour might be controlled, limiting erosion while constructing set back flood defences.

The more adaptive approach (sub- option SO3b) provides the opportunity to sustain the open space while providing a framework to retain beach levels and developing a sustainable attitude to management of the area. This approach, results in significant cost benefits, while accepting there would be change in use to the frontage. While, within this Strategic Management Approach, this would be the preferred approach, the sub-option would need to be developed in detail through discussion with landowners, key users of the area and the community. Change in this area might be expected to occur over the next 20 to 30 years, allowing time for further discussion as the approach is developed.

Along the Promenade frontage, the Strategic Management Approach SO3 aims to sustain risk management to the main length of the Promenade, with the opportunity to adjust the outline configuration of nearshore and shore-connected structures in a more integrated approach to the development of the Promenade.

Included within the Strategic Management Approach SO3 is an allowance for construction of a stepped length of wall leading down to the area of recharged beach at the western end of the main Promenade (as indicated in Figure 5.10). This element of the proposed works does add significant cost (£1.5M, compared to around £0.2M for basic maintenance of the existing wall) but with scope for adjustment during detailed design.

Within the overall Strategic Management Approach (sub-option 3a), in line with the overall adaptive approach being taken, defences along the Foster Bolitho Gardens frontage would be allowed to fail and would be removed. In contrast to Sub-option SO2a, where the intent would be to allow erosion, ultimately protecting the road on a setback line, the Strategic Management Approach SO3 introduces nearshore submerged breakwaters, limiting erosion and encouraging the development of a wider natural area of beach.

This more controlled approach over the Foster Bolitho Gardens area delivers a substantial cost reduction compared to the fixed defence approach (SO2) and is only marginally more costly compared to full managed realignment (SO2a). In combination with a more detailed assessment of the configuration of the terminal shore-connected breakwater at the end of the main promenade, there is the potential to allow a more designed approach to the whole area of the Foster Bolitho Gardens area This aims to balance the need for adaptation, while sustaining at least part of the current use of the area. This would allow creation of a more attractive area of beach.

Change in this Foster Bolitho Gardens area is likely to be needed over the next 20 years, allowing detailed development from the outline approach. On this basis, under this adaptive Strategic Management Approach SO3a, controlled realignment is the preferred approach.

There would still be the need for significant partnership funding to deliver this Strategic Management Approach. It is reasonable to assume, at this stage, that partnership funding could be available over key areas, including Eastern Green / Longrock, Penzance Harbour, Newlyn and the coast road to and Mousehole.

In the area of western Marazion, the preferred approach for controlled realignment would result in some loss of assets such as, potentially the boat club and areas of car park. However, there is scope within the Strategic Management Approach to mitigate such loss in redesign of the open area. The main benefit would be in the reduced cost and in maintaining a more sustainable beach area without the need for progressive raising of defences.

The Approach would still incur the need for some protection to the road through to Marazion but, in setting back flood defences, would reduce the need for defences to be undertaken within Marazion Marsh. Part of the economic justification for this has to be seen within the context of maintaining the integrity of the Marsh and sustaining the full length of the railway line.

With respect to Strategic Management Approach SO3 the following points may be summarised:

- The Approach offers a more adaptive approach to management, specifically in the areas identified by the SMP, addressing the longer term concerns over loss of sediment and sustainability of defence.
- While this Approach comes with an increased PV cost,
    - The Approach still maintains the economic justification for continued risk management.
    - Over the longer term there is a reduction in actual cost, while maintaining a greater degree of flexibility in how risk management might be managed in the future within the uncertainty associated with the rate of sea level rise.
    - The need for earlier investment in major structures provides a stronger framework for planning (less reactive), providing a stronger framework within which to develop partnership funding.
- Through a more adaptive approach to defence there is better opportunity for collaborative development of schemes, integrated with land use planning and creation of Place.

More specifically, under this Strategic Management Approach:

- Maintaining defence to the core part of Marazion is sensible and deliverable.
- Some form of control realignment (with setback defences) is the preferred approach to the western part of Marazion, providing opportunity for more sustainable management of this area.
- Risk management would be sustained to the Eastern Green / Longrock frontage, maintaining, and potentially enhancing, the use of the area.
- Maintaining and improving defence to the Penzance Harbour critically depends on the main Harbour structures. Logically, assuming the continued need to sustain the use of the Harbour, the approach offers a sustainable and affordable approach to defence.
- Specifically, under this general approach, there is potentially greater benefits in modifying the form of defence at the interface between the Harbour defence and that of Eastern Green and at the interface between management of the Promenade and modifying the defence to the Headland.
- Continued defence of the Promenade area remains economically justified but with an increased need for partnership funding.
- Over the Foster Bolitho Gardens area, the Approach, including submerged breakwaters, offers significant benefit in comparison to maintaining existing defences with the opportunity to redesign use of the area in a managed manner.
- The option for managed realignment at Tolcarne has been considered but is rejected as delivering no economic benefit.

- Maintaining and improving defence to the Newlyn Harbour critically depends on the main Harbour structures., Assuming the continued need to sustain the use of the Harbour, the approach offers a sustainable and affordable approach to defence.
- Continued defence of the coastal road access to and the main area of Mousehole is sensible and considered deliverable and sustainable.

The Strategic Management Approach SO3 (with the inclusion of sub-options discussed above) is considered to deliver a far more balanced approach to management compared to SO2 and this is shown in Figure 16-26 , based on the discussion of the strategic outcomes. (As with Figure 6-13 shown in Section 6.1.2.4, Figure 16-shows the overall balance between different aspects (Economy, Health and Security, Nature and FCERM) set out in the strategic outcomes. The outcome for SO2 is shown in outline on the Figure for comparison.)

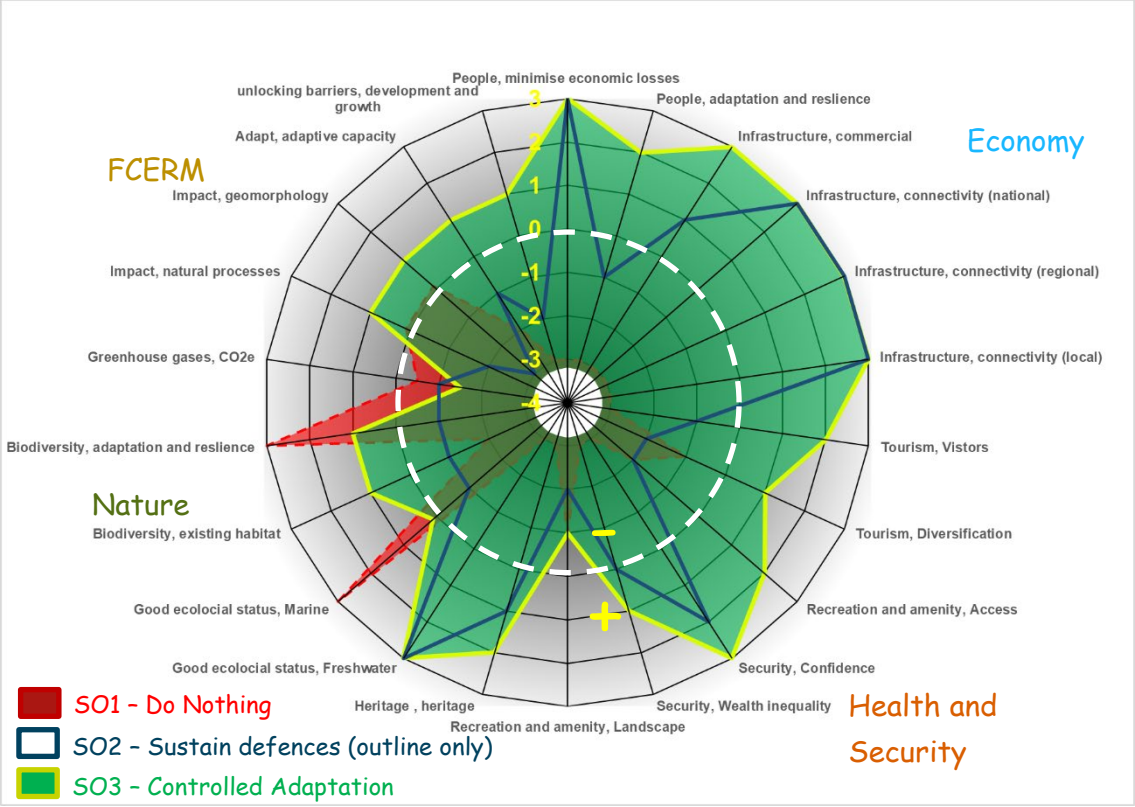


Figure 6-26. Overview assessment of SO3 – Controlled Adaptation.

6.1.4 Option 4 - Controlled Adaptation with Sand Scaping

6.1.4.1 Description and Assessment of Option and sub-options

This Strategic Management Approach SO4 builds from Approach SO3 over much of the area, with the focus on the change in management associated with the Eastern Green / Longrock frontage, alongside the implications that major sediment recharge (Sand Scaping) scheme would have on potential management of the Marazion area. In addition, the potential interaction with management of the northern end of the Penzance Harbour area is considered. The primary Approach (SO4) and potential sub-options (SO4a and SO4b) being considered are set out in Figure 6-21.

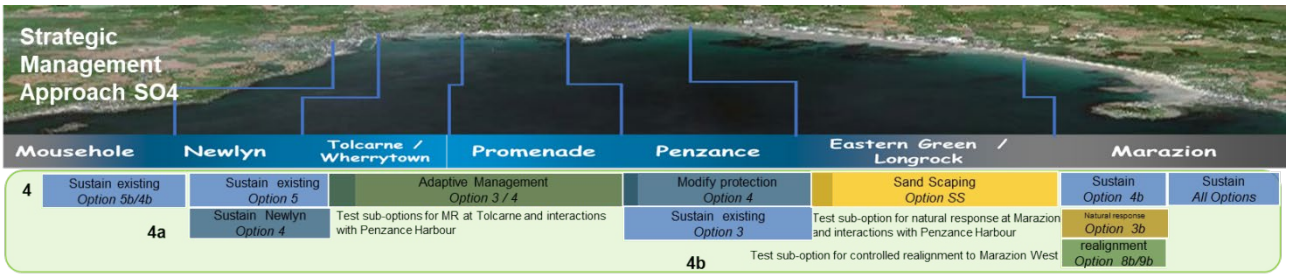


Figure 6-27. Approach SO4 and definition of sub-options.

This is changed slightly following the discussion of Strategic Management Approach SO3, in that it has been demonstrated in Section 6.1.3 that there is no additional benefit delivered by realignment at Tolcarne and that consideration has already been given to the interaction between management of the Harbour Headland and the management of the Promenade. Neither of these situations, nor the conclusion drawn from the examination of Approach SO3 would be influenced by the introduction of a Sand Scaping Approach to the Eastern Green / Longrock frontage. Therefore, these areas are not considered further.

As such the following discussion focuses on the eastern half of the overall strategy area.

The Sand Scaping concept differs in principle from traditional sediment recharge (as included in SO3) in that the aim under Sand Scaping quite specifically aims to allow the spread of sediment over a wider area, rather than attempting to retain sediment in specific areas. In this, the aim of the Approach SO4 is both to provide direct protection to the specific vulnerable area where sediment is initially placed, while feeding the broader system with additional sediment.

This is key to the Eastern Green / Longrock area in that there are areas across the central section of the frontage that are immediately vulnerable, whereas other areas, such as towards Marazion, the risk is over a slightly longer term. Sand Scaping addresses the immediate problem allowing the spread of sediment to address broader issues in the future. The initial scheme delivering Sand Scaping is described as a “Sand Engine”, reflecting this concept that it delivers a mechanism, working with natural processes to deliver risk management over a longer period of time.

This has been considered in the modelling undertaken as part of the Long Term Options Appraisal study (RHDHV 2019), referenced in Appendix C. From this work, it has been assessed that the volume of sediment delivered in the initial Sand Engine would be in the order of 1.3M m^3. The subsequent need for further nourishment to maintain a threshold protection width of sediment over the main Eastern Green / Longrock frontage would be typically in 35 to 40 years from construction of the initial Sand Engine.

Delivery of sediment to adjacent areas would develop over a 10 to 15 year period, addressing the longer term issues.

Modelling shows that subsequent renourishment would be in the order of 40% of the initial placement volume. This second stage renourishment would be undertaken as a single operation some 35 years after construction of the initial Sand Engine. (Potentially the required volume for renourishment could increasing to 50% of the initial volume in the longer term, typically 35 to 40 years after the second stage renourishment.) The main loss from the initial placement would be longshore, indicating that the Approach maintains a good sediment resource added to the wider shoreline system over the longer term.

A key consideration in developing this option, recognising reliance on a single form of management, has been the availability and source of sediment.

Given this sensitivity, early contractor involvement has been sought, reviewing this and the costs associated with major sediment supply. This gives a reassurance on costs and is discussed in Appendix D.

Through this work, a possible closer source has been provisionally identified. This has not as yet been confirmed but indicatively there could result substantial cost savings if this alternative site was viable.

The costs discussed later are based on an established sediment source some 200km from Mount's Bay. If an alternative closer site were available this could reduce costs by potentially 50%, similarly reducing also the potential carbon footprint of the approach (Appendix E). This would need to be investigated further in detailed development of the Approach, offering potentially significant cost savings.

6.1.4.2 Overview of constraints and opportunities

The opportunities and constraints over the western part of the Strategy area are discussed previously in Section 6.1.3.2. In summary, this identified that:

- In sustaining the basic defence structure to the Harbours and maintaining access to Mousehole along the coastal road, this maintains the opportunity for development and regeneration within these areas.
- Within the area of the Promenade, the Approach creates a more varied approach to defence, allowing the opportunity for defence to be integrated within the aspirations for Place Shaping, in line with ideas emerging from the Neighbourhood Plan, but without constraining future opportunities in relation to the Lariggan valley.
- In addition the Approach allows a more sympathetic method of realigning the area of the Foster Bolitho Gardens adding increased opportunity for use and a better transition between land and the sea.

Furthermore, the overall approach (Strategic Management Approach SO3) to the western part of the Strategy area (carried forward to Strategic Management Approach SO4) offers better opportunity to minimise impact on the nearshore area, potentially creating opportunity for habitat development.

More specific to this Strategic Management Approach SO4 (in contrast to Approach SO3) are the opportunities created by the Sand Engine over the Eastern Green / Longrock area and in management of the Marazion frontage. This is set out in outline in Figure 6-28.

The increased upper beach width supports and allows development of features associated with the County Wildlife Site, in particular creating the width and sediment necessary to support the restoration of dunes over the main length but also supporting the growth of the Marazion Dunes. Associated with this is the opportunity to enhance beach use and connection with the Coast Path.

The increased sediment also provides greater opportunity for more adaptive approaches to management over the western part of Marazion, reducing the pressure on this frontage and allowing greater opportunity to manage flood and erosion risk through reducing the reliance on harder forms of defence. There will continue to be a need for some form realignment but with the focus more on how the flood risk is managed rather than the risk of erosion and beach loss.

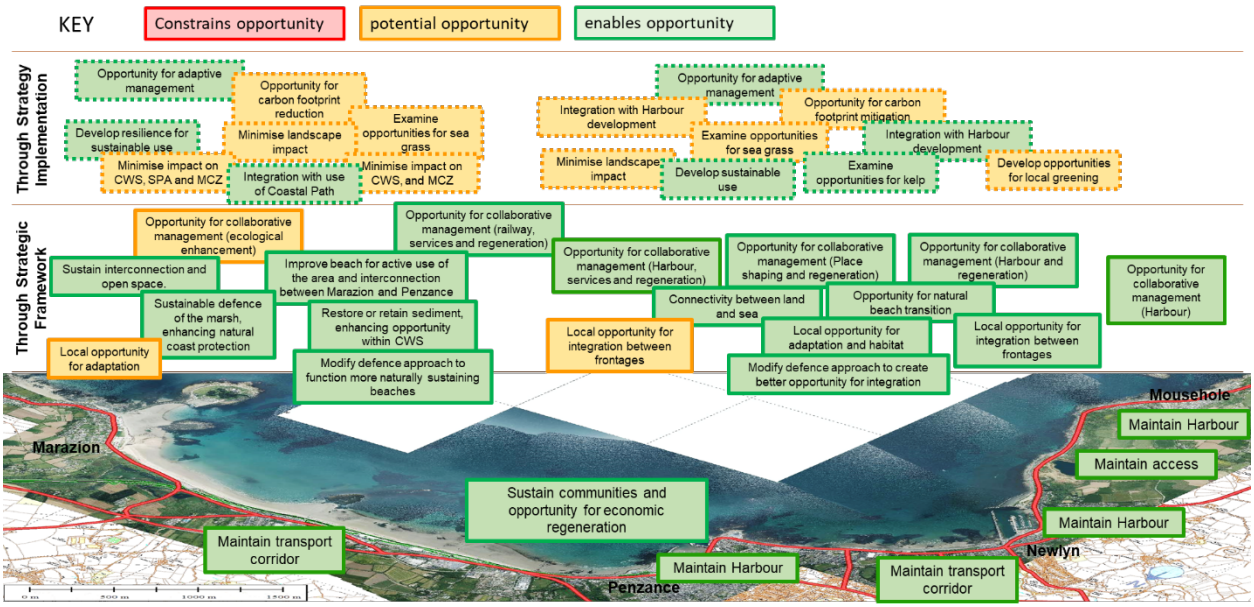


Figure 6-28. Opportunities and constraints associated with SO4 – Controlled Adaptation with Sand Scaping.

Over the longer term, while accepting that the Sand Engine would result in a significant change on the landscape compared to the present, the natural evolution of the beach over the whole area would maintain the current long uninterrupted sweep of shoreline, highlighted within the Landscape Character Area CA04.

Creating a more naturally functioning shoreline would provide a more natural transition between land and sea over the upper beach area but would also create a more natural transition between foreshore and the nearshore regime.

The SEA does identify potential impacts such as the risk of smothering areas of the lower beach and increased windblown sand impacting on the area of the Marazion Marsh. These issues have been initially considered in the studies supporting this Strategy (RHDHV 2019), but would need to be considered further in development of a Sand Scaping approach.

Notwithstanding the possible need to avoid or mitigate such impacts through detailed design, the more adaptive approach based on an improved sediment resource within the area, does potentially maintain the opportunity to enhance features of the Marine Conservation Zone.

Adaptative Capacity

Section 6.1.3.2 discusses the adaptive capacity in relation to the Promenade area, recognising that the early investment in breakwaters does determine the future general management of the area. However, the Approach does allow much better opportunity for integration with broader scale planning of the use of the Promenade, while also maintaining the opportunity of further consideration of management of the Lariggan valley and providing the structure within which the Foster Bolitho Gardens area might be managed into the future.

The Approach, therefore, while establishing strong framework for management of the Promenade area does maintain the ability and capacity for further adaptation, responding to the uncertainties associated with climate change.

Similarly in the areas around the Harbours, even though the overall approach to management is to sustain the existing defences, there is still scope for some local adaptation in detail. The Approach aims to provide a clear pathway for future management with the intent to sustain the use of the Harbours and protection to the essential hinterland use, providing confidence in planning future investment.

Over the eastern frontages Strategic Management Approach SO4 would be delivered in stages. The initial stage delivers the medium term security, while also establishing a substantial longer term sediment platform. Once constructed, the Sand Engine delivers little opportunity for subsequent adaptation over that short to medium term period.

Over the following 35 to 40 years (from construction of the initial Sand Engine) it is anticipated that, taking a Sand Scaping approach into the future, would require further major renourishment, with a further campaign of renourishment potentially in Year 70. Therefore, there is the opportunity for review and adjustment built in to this management process. A significant benefit in this is seen in the fact that the initial recharge lays down a basic and substantial platform of sediment, currently absent from the shoreline system, such that future renourishment is likely to be at a smaller scale and that any modification to the overall Approach is from an improved starting point in terms of the health of the important beaches.

The decisions for, and timing of future investment would be in response to the behaviour of the coast, allowing possible modification of the approach in response to broader scale change and the uncertainties of climate change. This, therefore, offers a more responsive approach to management compared to Approach SO3, while still providing the confidence in the protection of the area in the short to medium term (unlike the more piecemeal approach of SO2). The expectation and clear intent under Strategic Management Approach SO4 is for continued longer term management of the area through the provision of additional sediment, while allowing review and adaptation of the Approach in response to future uncertainty.

The increased sediment supply to the east offers better opportunities for sustainable management of the Marazion Dunes, allowing also the ability to develop adaptive approaches to management of the western Marazion area.

Strategic summary

A detailed assessment of Strategic Management Approach SO4 is considered through the SEA being undertaken in combination with the development of the Strategy. Within this section of the report an overview is provided based on the Strategy objectives (Section 2.4) and set out in line with the core aims related to the Cornwall Environmental Growth Policy (economic, health and security and the natural environment) and incorporating critical aspects of Defra's policy statement, as discussed in Section 2 of this report.

This overview is presented in Figure 6-29, comparing Strategic Management Approach SO4 with the Do Nothing (SO1) and Strategic Management Approach SO2 (linear defence).

Approach SO4 delivers against the overall FCERM economic indicators, in terms of substantially reducing the risk of loss of property, transport and supporting existing economic development. From the preliminary analysis with respect to carbon footprint (Appendix E), it is indicatively shown that introducing sediment,

rather than relying on rock armour, reduces the carbon footprint, when compared to either Strategic Management Approach SO2 or SO3.

The Approach maintains the freshwater Marsh and improves the resilience of the Marazion Dunes, while more generally restoring sediment to the foreshore.

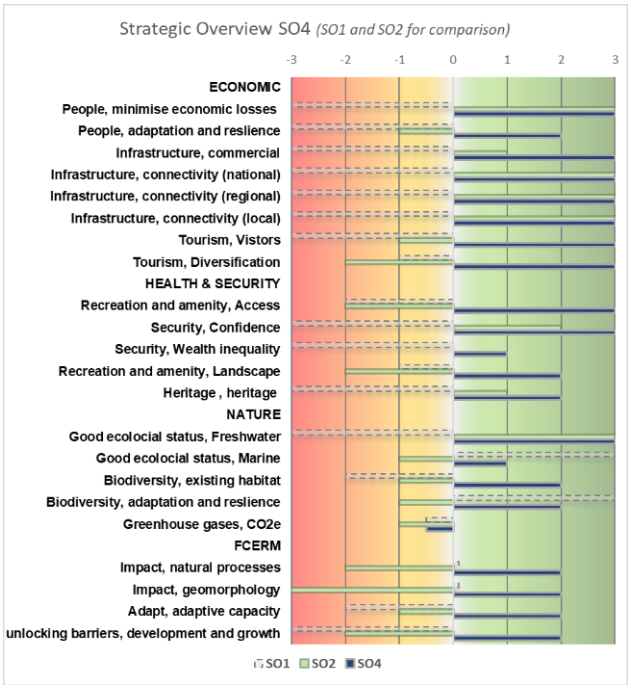


Figure 6-29. Strategic Summary for SO4.

The large expanse of sand over the Eastern Green / Longrock frontage, while potentially being quite imposing, avoids the need for continuing to extend hard rock revetments or major nearshore structures. Clearly, the use of breakwaters along the Promenade still imposes on the landscape but in an area which is already strongly dominated by the built environment. To a degree this Sand Scaping Approach to the east of Penzance, in combination with the more strongly controlled management to the west, creates two very different environments, encouraging diversity of use and coastal value.

As with the construction of the breakwaters along the Promenade, there is a need for early major investment in the Sand Engine. However, this does establish a strong framework for defence.

This would act to engender greater confidence in the area as a whole, while, over the Eastern Green / Longrock frontage, still working with natural processes. Accepting the need for defence, this Approach effectively resets the natural geomorphological development of that frontage.

The wider expanse of sand creates continuous access to the beach and foreshore along the whole eastern frontage, further supporting recreational and activity use, in line with Cornwall's Environmental Growth policy in a very demonstratable manner.

Importantly the SO4 Approach aims to address the fundamental issues identified by the SMP in terms of long term sustainability and in adapting to the increasing coastal pressure due to sea level rise.

It is concluded that Strategic Management Approach SO4 delivers on the strategic objectives and outcomes for the wider area.

6.1.4.3 Economic, Commercial, Financial and Management Assessment

Economic Assessment

Damages.

At the strategic level it is taken that defence would be improved to provide sustainable use of the area, providing an appropriate high standard of protection. As such it is assumed that there would be no residual damages (except in areas specifically considered by the sub-options). This assumption would need to be tested in developing schemes in specific areas but provides a sensible consistent strategic baseline for assessing different Strategic Management Approaches.

The benefits of continuing to provide this standard of defence derive from the avoidance of damages set out in Table 6-1, with a total overall PVc benefit of £395M.

Costs and Cost Profile.

The cost of Strategic Management Approach SO4 is built up from an assessment of actions required for each defence area over the full 100 year period of the Strategy, allowing consideration of more specific local areas. With respect to this Approach, allowance has been made for provision of 1.3M m^3 of sediment in Year 12, with subsequent renourishment in Years 45 and 70. There would be the need to continue maintaining some defences initially and the potential need to raise crest levels to certain defences in the long term. This takes a precautionary attitude in addressing the uncertainty of sea level rise.

The overall results of this assessment (including Sand Scaping, the construction of control structures over the Promenade area and sustaining existing defences in other areas) are presented in Figure 6-30 for the whole area.

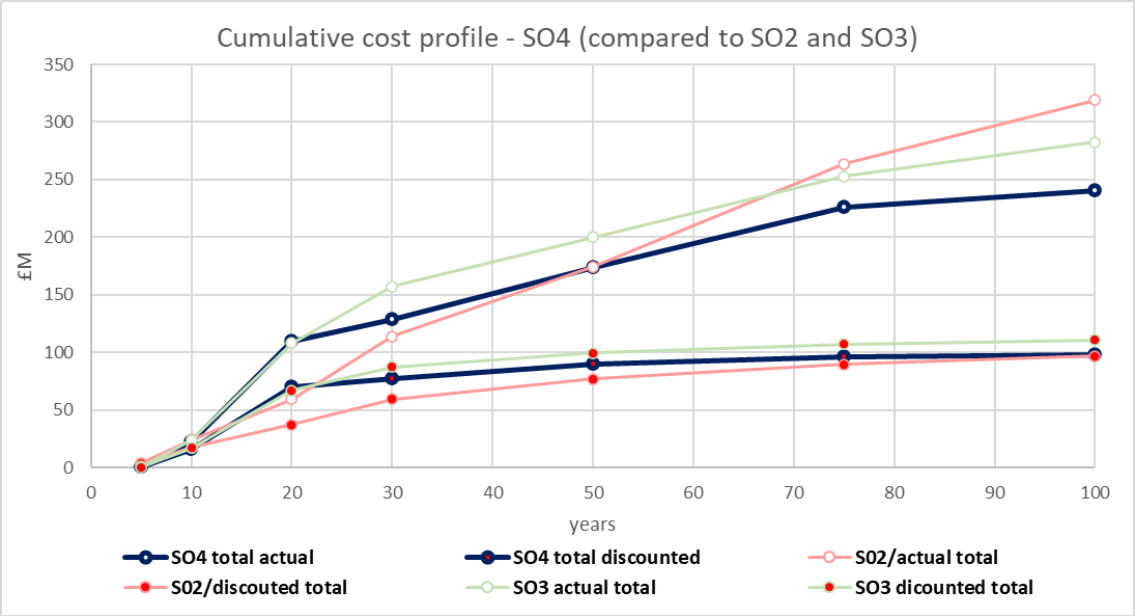


Figure 6-30. Cumulative Cost Profile for SO4

The figure shows an overall cash cost of Strategic Management Approach SO4 in the order of £240.7M, with a Present Value cost (PVc) of £98.37M. For context, this is compared to Approach SO2 and SO3, showing that across the whole area the actual cost of Approach SO4 is substantially reduced and that, in terms of PVc, SO4 results in a similar discounted cost compared to a fully linear approach to management (SO2).

This clearly has to be considered at a more local level with respect to individual frontages.

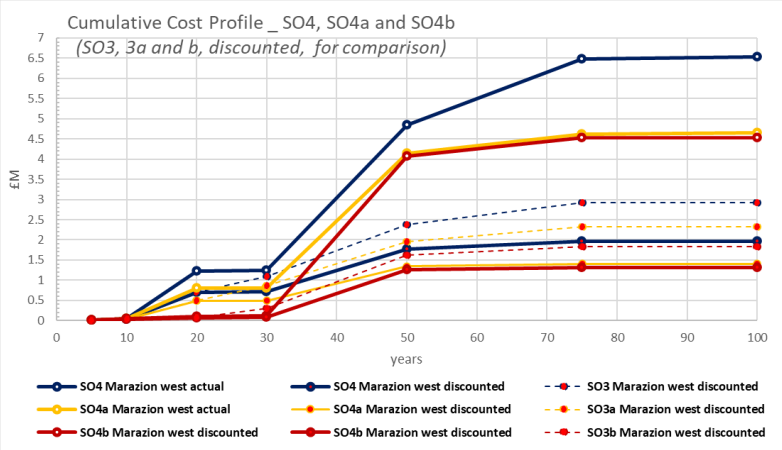
Marazion

The core element of the Town would continue to be defended with a cost in the order of £7.6M (PVc £2.2M) as discussed previously (Section 6.1.2.3 Approach SO2).

As with Approach SO3, three options are considered over the western part of Marazion:

- The primary Strategic Management Approach SO4 sustaining and raising existing defences (including those within the area of the Marazion Marsh),
- Allowing the shoreline to adapt naturally, providing resilience measures to property (sub-option SO4a) and
- Sub-option SO4b, controlling and limiting erosion, retaining sediment, with setback defences addressing the flood risk.

The cost profiles for each sub-option are shown in Figure 6-31, showing also the equivalent costs profiles base of Strategic Management Approach SO3.



The cost of maintaining the existing defences (under SO4) is substantially reduced due to the increased supply of sediment compared to the equivalent option under SO3 (a reduction in PVc of £1M).

Even so this is still a significantly greater cost (£6.5M actual, £1.97PVc) compared to sub-option SO4a (£4.7M, PVc £1.41M) or option SO4b (£4.5M, PVc £1.31M).

Figure 6-31. Cumulative cost profiles- Marazion west SO4.

The additional sediment supply delivered by the Sand Engine over time, reduces the scale of works but also importantly has the potential to extend the time before change might be needed, by possible 5 to 10 years. This, reduces the PVc cost typically by £0.9M or £0.5M compared to Options SO3a or SO3b, respectively.

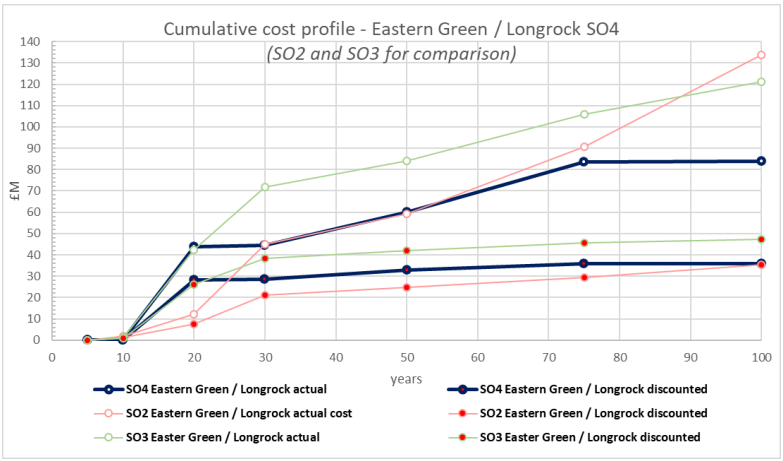
From an economic perspective, the preferred approach is for controlled realignment. This approach avoids significant raising of the front face defence, creating a more connected approach between the open space and the beach, while still providing the opportunity, potentially, to sustain use and features within the area.

From this perspective, this element of the Strategic Management Approach sub-option SO4b would be taken forward as the preferred option for discussion of future management with the land owner, coastal users and the community.

Eastern Green / Longrock

The cost profile for management under the Sand Scaping approach for this frontage is shown in Figure 6-32.

The actual cost under this Strategic Management Approach SO4 Approach is £84M with costs being substantially less than either Approach SO2 (£133.8M) or Approach SO3 (£121.3M).

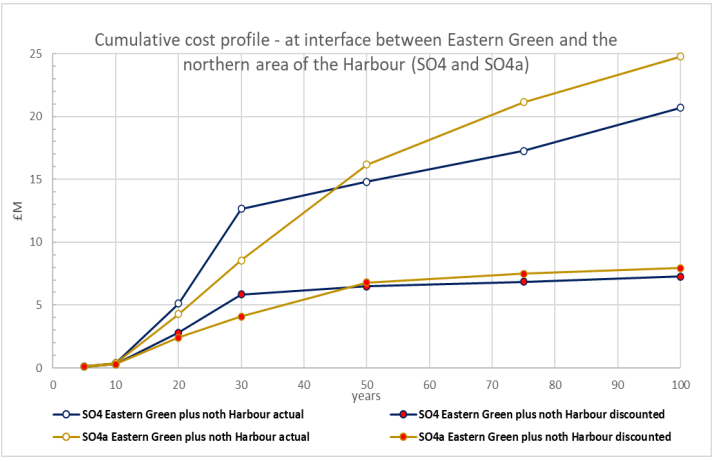


Despite the need for substantial investment in earlier period there is parity in investment over 30 years (i.e. within the period covered by the initial recharge), with the increasing need for further works to sustain the linear approach with sea level rise and falling beach levels into the future.

Figure 6-32. Cumulative cost profile - Eastern Green / Longrock SO4.

This increasing cost associated with SO2 means that over the strategy period the discounted cost of the Sand Scaping Approach has a similar discounted cost (PVc £35.83M) compared to that of Strategic Management Approach SO2 (PVc 35.19M). This has to be considered alongside the potential savings made with respect to the Marazion area (as shown in Figure 6-31).

The Sand Scaping Approach also provides additional sediment along the northern Harbour area. This is assessed as delivering some direct benefit in terms of costs with respect to the linear approach to defence of the northern area of Penzance Harbour; typically in the order of £0.55M PVc. (Figure 6.33).



More significantly, if a series of short breakwaters are introduced at the interface between the Harbour and Easter Green (as assumed under Approach SO4), then this provides an overall reduced cost compared to allowing sediment from the Sand Engine to accumulate naturally at the interface.

Figure 6-33. Cumulative cost profile SO4 and SO4a, interface between Penzance Harbour area and Easter Green.

Effectively, the short breakwaters act to retain and build a higher beach level at the western end of the Eastern Green frontage. The comparison in cumulative cost profile directly associated with the interface area is shown in Figure 6-33.

While this would need more detailed modelling and further development of the Strategic Management Approach, it may be concluded that the general Sand Scaping Approach offers the opportunity to consider a modified management of the interface between Eastern Green and the Penzance Harbour area.

Other areas

In all other areas, management would be as discussed in Section 6.1.3.3.

The overall conclusions of the above economic assessment in terms of how management would be delivered across the whole area under Strategic Management Approach SO4, is shown in Figure 6-34.

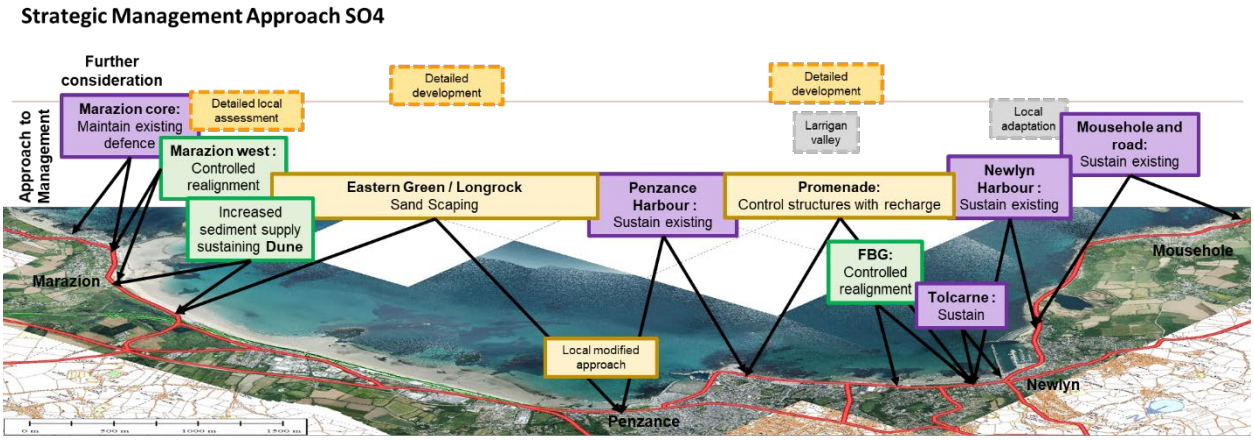


Figure 6-34. Integration of local application of Strategic Management Approach SO4

Table 6-10 summarises the economic case for Strategic Management Approach SO4, highlighting how different sub-options have been incorporated within the overall Strategic Management Approach SO4. The Table also provides a comparison of benefit cost ratios for each area compared to Strategic Management Approach SO2 for reference.

Table 6-10. Summary of economic assessment for SO4

Location	Approach or sub-option	Do Nothing PVd (£M)	PV Residual Damages (£M)	Benefits PVb (£M)	Costs PVc (£M)	Net Present Value NPV (£M)	Benefit Cots Ratio BCR	BCR Comparison SO2
Marazion Core	Option SO4	7.08	0	7.08	2.2	4.88	3.22	*3.22*
Marazion west and Dunes	Option SO4b	4.27	0.27	4.0	1.31	2.7	3.05	*0.85*
Eastern Green / Longrock	Option SO4	172.7	0	172.7	35.83	136.87	4.82	*4.91*
Penzance Harbour	Option SO4	28.53	0	28.53	12.61	15.92	2.26	*2.16*
Promenade (MR at FBG)	Option SO4	74.04	0.1	73.94	29.9	44.04	2.47	*3.34*
Newlyn and Tolcarne	Option SO4	79.16	0	79.16	11.1	68.06	7.13	*7.13*
Mousehole and Coastal Rd.	Option S04	28.92	0	28.92	4.62	24.3	6.26	*6.26*
	Total	**394.70**	**0.37**	**394.33**	**97.57**	**296.76**	**4.04**	*4.23*

The Strategic Management Approach SO4 is demonstrated to be economically justified both overall and in relation to all individual areas.

Commercial

The Strategic Management Approach SO4, aims to sustain existing defences in areas such as Marazion (core), Penzance Harbour and Newlyn (including Tolcarne) and to Mousehole and the coastal road. To a degree, in these areas this would perpetuate current management, critically in areas where there is already a relatively planned approach. Within the two large Harbour areas this planning is as part of on-going management of the operation of the Harbours. As such, the delivery of works in these areas would follow a traditional viable procurement route.

With respect to the Promenade area, Strategic Management Approach SO4 would provide an agreed overall approach setting a clear framework and intent. As such, and with the intent to construct major strategic control structures, the development of specific schemes would be planned allowing development of a short to medium term procurement route.

The construction of the Sand Engine would require quite specific plant, with the potential for significantly different approaches from different contractors; and may depend upon availability of large dredgers. To a degree, the process of procurement would benefit from early selection of a contractor with the potential to programme construction around availability of specialist plant. This process would be further influenced by the potential use of an alternative source of sediment, which would require significant staged investigation.

Notwithstanding these matters, major sediment recharge has been undertaken successfully and effectively in other areas of the UK and poses no major challenge.

Financial

There is an on-going need for an integrated approach to funding, with key partners being identified as:

- Each of the main Harbour Authorities,
- Highways Authority
- Utility providers and
- Network Rail.

The broader scale approach, defined by Strategic Management Approach SO4, provides a strong framework for investment, with major works being required over the short to medium term. This clearer approach for significant investment would allow a stronger pathway for the potential partnership organisations to seek appropriate funding and enable subsequent development of a funding plan (compared to the more piecemeal approach offered by Strategic Management Approach SO2). From this perspective Approach SO4 has the potential to develop a more secure funding programme.

Strategic Management Approach SO4 offers creation of two contrasting management approaches over the two longer frontages of Eastern Green / Longrock and the Promenade, offering potentially different sources of partnership funding, under a common banner of Place Shaping and delivery of an integrated approach to coastal management and regeneration.

The high costs over the initial 10 to 20 years does raises a challenge in terms of programming this funding, however, in developing this within a clear strategic approach, this aims to ensure that opportunities can be maximised in a coherent manner.

Despite the increased cost in some areas, there is a realistic and enhanced opportunity for significant additional partnership funding.

6.1.4.4 Summary Discussion of Option and Sub-options

The Strategic Management Approach SO4, incorporating elements of SO3, delivers the core risk management function, taking an approach more sensitive to the aim to reconnect Penzance and the broader area with the shore.

In particular the approach maintains a degree of flexibility for adaptation of risk management in an integrated manner alongside opportunity for regeneration and enjoyment of the coastal environment. Over the Eastern Green / Longrock frontage, extending through to Marazion, the approach provides a blank

canvas within which there is the opportunity to encourage an increased diversity of use, while maintaining an upper beach access between Penzance and Marazion, complimenting the more formal Coast Path.

The enhanced supply of sediment through to Marazion maintains the development of the Marazion Dunes, while also offering greater opportunity to develop a more connected use of the western part of the Town associated with a degree of adaptation. While, within this Strategic Management Approach, controlled realignment would be the preferred approach, the Approach would need to be developed in detail in discussion with landowners, key users of the area and the community. Change in this area might be expected to occur over the next 25 to 35 years allowing time for further discussion as the approach is developed.

As with Strategic Management Approach SO3, along the Promenade frontage, the approach aims to sustain risk management to the main length of the Promenade, with the opportunity to adjust the outline configuration of nearshore and shore-connected structures in a more integrated approach to the development of the Promenade. Within this Strategic Management Approach SO4, as discussed in SO3, defences along the Foster Bolitho Gardens frontage would be allowed to fail and would be removed, allowing the development of an area of beach, connected to the existing open space. This more controlled approach to management delivers a substantial cost reduction compared to the fixed defence approach (SO2) and is only marginally more costly compared to full managed realignment.

As with SO3, the intent would be to maintain the existing defence across the Tolcarne frontage, linking through to continued management of the larger Newlyn area.

With respect to Strategic Management Approach SO4 the following points may be summarised:

- The Approach offers an adaptive approach to management specifically in the areas identified by the SMP, addressing the longer term concerns over loss of sediment and sustainability of defence.
- The Approach delivers full protection to the main frontages (with potential for controlled realignment to the western area of Marazion and over the Foster Bolitho Gardens area) with an overall economic value (over the whole area) similar that that of the more fixed Strategic Management Approach SO2. This, despite the need for earlier major investment, does indicate a more sustainable long term approach.
- Through the more adaptive approach to defence there is better opportunity for collaborative development of schemes, integrated with land use planning and creation of Place.

More specifically, under this Strategic Management Approach SO4:

- Maintaining defence to the core part of Marazion is sensible and deliverable.
- Some form of controlled realignment (with setback defences) is the preferred approach to the western part of Marazion, providing opportunity for more sustainable management of this area.
- Risk management would be sustained to the Eastern Green / Longrock frontage, maintaining and potentially enhancing the use and diversity of use over the full foreshore and backshore area.
- Maintaining and enhancing the supply of sediment offers greater flexibility in management of the western area of Marazion, while sustaining the development of Marazion Dunes and creating the opportunity for further dune development to the back of the main recharge area.
- At the same time, the supply of sediment to the interface area between Penance Harbour and Eastern Green, offers the potential to modify the approach to defence in this area.
- Maintaining and improving defence to the Penzance Harbour critically depends on the main Harbour structures, but assuming the continued need to sustain the use of the Harbour, the approach offers a sustainable and affordable approach to defence.

- As with Approach SO3 there is potentially greater benefits in modifying the form of defence at the interface between the Harbour defence and management of the Promenade, modifying the defence to the Headland in a manner that potentially reduces the visual impact.
- Continued defence of the Promenade area remains economically justified but with an increased need for partnership funding.
- Over the Foster Bolitho Gardens area, the Approach, including sub-merged breakwaters, offers significant benefit in comparison to maintaining existing defences with the opportunity to redesign use of the area in a managed manner. This would need to be developed in detail as the Strategy is implemented.
- The defence to the Tolcarne frontage would be sustained.
- Maintaining and improving defence to the Newlyn Harbour critically depends on the main Harbour structures, but assuming the continued need to sustain the use of the Harbour, the approach offers a sustainable and affordable approach to defence to the wider area.
- Continued defence of the coastal road access to and the main area of Mousehole is sensible and considered deliverable and sustainable.

The Approach builds from the SO3 Approach, specifically addressing possible constraints imposed by the use of breakwaters over the Eastern Green / Longrock frontage. In particular the Strategic Management Approach, incorporating the use of the Sand Scaping concept, delivers significant benefits in terms of reconnecting the use of the coast and the shoreline, potentially offering greater diversity both in terms the natural environment and recreational use. The two man frontages along Eastern Green / Longrock and that over the Promenade offer significantly different environments, offering different funding opportunities alongside different focus for coastal use.

These differences are reflected in the assessment of strategic outcomes shown in Figure 6-35.

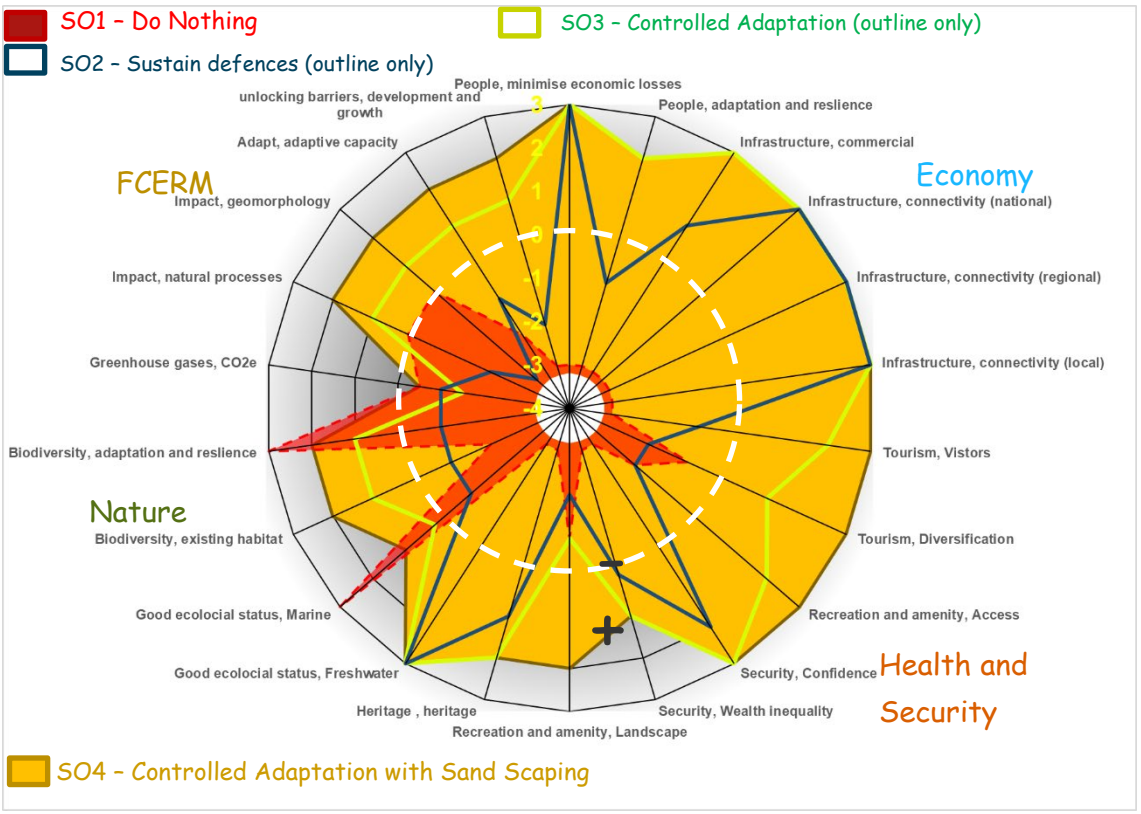


Figure 6-35. Overview assessment of SO4 - Controlled Adaptation with Sand Scaping

6.2 Comparison and Discussion of Strategic Management Approaches

Throughout the discussion provided above in Sections 6.1.2, 6.1.3 and 6.1.4, to degree comparisons between options have been made and discussed, aiming to provide context to the different Strategic Management Approaches. This comparison is brought together in summary and is developed further in the discussion below.

In considering each Approach, various sub-options have been considered, testing local variation from the primary Approach. For each general Approach this has resulted in locally preferred options for management over specific locations.

Specifically:

- Under Strategic Management Approach SO2.
    - The lack of sediment to Marazion drives the need for realignment (with local resilience measures) to the western part of the Town.
    - There is the potential to modify the management to the Headland and this would need to be investigated further in detail.
    - It is difficult to justify continued defence to the Foster Bolitho Gardens area and this frontage could be realigned (with setback defence to the road).
- Under Strategic Management Approach SO3.
    - The increase in sediment supply to the west of Marazion allows a more controlled approach to the western frontage and this is shown to be justified in comparison with merely allowing natural realignment with resilience measures.
    - There is the potential to modify the defence approach to the northern end of the Penzance Harbour area (Chyandour), linked with the controlled approach at Eastern Green. This would need to be investigated further in detail.
    - There is the potential to modify the management to the Headland and this would need to be investigated further in detail.
    - Stronger control would be justified with respect to the Foster Bolitho Gardens area allowing a more managed approach to realignment.
    - It is confirmed that there is good economic justification for continuing to sustain defences along the Tolcarne area.
- Under Strategic Management Approach SO4.
    - The substantial increase in sediment to the western Marazion area, sustains the development of the adjacent dunes and reduces pressure on defences to western Marazion. Even so, some form of controlled realignment remains the preferred local approach.
    - There is increased justification for modification of the northern end of the Penzance Harbour area (Chyandour), with the opportunity to retain the increased sediment feed to the area. This would need to be investigated further in detail.
    - There is the potential to modify the management to the Headland and this would need to be investigated further in detail.
    - Stronger control would be justified with respect to the Foster Bolitho Gardens area allowing a more managed approach to realignment.
    - It is confirmed that there is good economic justification for continuing to sustain defences along the Tolcarne area.

This is summarised in Table 6-11, reviewing and summarising the Strategic Management Approaches taken forward to the comparative assessment.

Table 6-11. Review and summary of Strategic Management Approaches (incorporating the preferred sub-options as discussed above).

Location	Mousehole and Coastal Rd	Newlyn		Promenade		Penzance Harbour			Eastern Green/ Longrock	Marazion	
Local area		Newlyn Harbour	Tolcarne	FBG	Promenade	Headland	Main Harbour	Chyandour		Marazion west	Core Town
SO1	Do Nothing (DN)	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN
SO2	Sustain	Sustain		Realign	Sustain	Modify?	Sustain		Sustain	Realign	Sustain
SO3	Sustain	Sustain		Controlled realign	Reshape management	Modify?	Sustain	Modify?	Reshape management	Controlled realign	Sustain
SO4	Sustain	Sustain		Controlled realign	Reshape management	Modify?	Sustain	Modify	Sand Scaping	Controlled realign	Sustain

Notes:

- Sustain
  - *maintain and sustain existing defences.*
- Realign
  - *allow coast to develop naturally but with setback defence line or resilience measures.*
- Controlled realign
  - *nearshore or cross-shore management to control and limit erosion and realignment, developed at a local level.*
- Modify?
  - *opportunity for modifying defences with the intent to mitigate the potential visual impact, to be investigated in detail.*
- Reshape management
  - *construct major nearshore and shore-connected structures, with sediment recharge, to be developed in collaboration with land use planning.*
- Sand Scaping
  - Undertake major sediment recharge (the Sand Engine) sustaining coastal processes and providing a wider beach landscape for land use planning.

6.2.1 Comparison

6.2.1.1 Strategic

The overall aim is to develop a Strategic Management Approach which balances the influence of managing the flood and coastal erosion risk on the economy, the health and security of people and communities, all set within the need for a robustly functioning natural environment, as set out in Cornwall's Environmental Policy and in line with the policy intent for FCERM.

A detailed assessment of the different Approaches is considered through the SEA being undertaken in combination with the development of the Strategy. How this information has been used in developing and accessing different Strategic Management Approaches is discussed in Section 2.4.1.

This assessment has been used, alongside the broader objectives to assess in terms of overall strategic outcomes, how the different Approaches to management deliver this balance in different ways. This recognises the difficulty of capturing in full, and in places quite detailed, local impacts identified in the SEA but aims to provide an overview relating to impacts and opportunities.

The results of this overview assessment are presented in Figure 6-36.

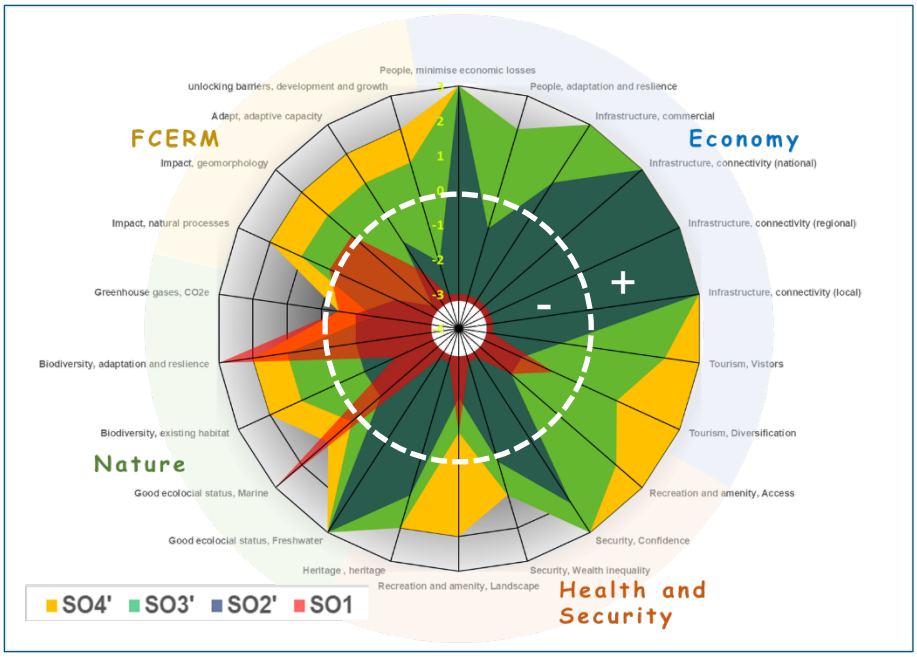


Figure 6-36. Overview Comparison of Approaches

The Figure highlights the very distinct difference between protection, provided under Strategic Management Approach SO2 (Sustain Existing Defences), compared to Do Nothing (SO1). The basic (SO2) approach to FCERM delivers important aspects of sustaining the economy, protecting historic assets and maintaining the integrity of the freshwater SPA of Marazion Marsh. However, it fails significantly in terms of the broader sustainability in terms of the natural environment, access to this natural environment and creation of a more diverse broader environment supporting regeneration and providing the opportunity for adaptive resilience.

The more adaptive Strategic Management Approach SO3, offers a more sustainable approach, creating opportunity for better integration between the FCERM requirement and other broader objectives. The approach may support specific improvement to the natural environment, such as opportunity for kelp currently being examined by the Environment Agency associated with rock structures, alongside greater opportunity for integration with the aspirations for regeneration and connectivity between land and sea.

The SO3 Approach offers significantly better opportunity to modify the approach to management over the Promenade frontage but still constrains opportunity for a more naturally functioning shoreline over the Eastern Green / Longrock area.

The benefits of the SO3 Approach over the western part of the Strategy area are maintained in Strategic Management Approach SO4, while being further enhanced by the inclusion of a Sand Scaping Approach over the Eastern Green / Longrock frontage. The SO4 Approach over the Promenade (using breakwaters to allow change away from the very linear current approach to defence (SO2)) aims to increase the width over which risk management is applied, within what is currently very strongly constrained area. Over less constrained area of Eastern Green / Longrock the SO4 Approach aims to restore a more naturally functioning environment. In combination, the different approach taken to the Promenade and over the Eastern Green / Longrock fronatge offers greater diversity of use and interest over the whole area.

Overall, it is considered that the difference seen between Approaches may be graded in terms of delivering the strategic outcome in a sustainable and holistic manner, with a progressive improvement working from:

- the Do Nothing Approach which fundamentally fails to meet these objectives,
- through to Approach SO2, which delivers to a very basic approach principally to FCERM, and
- Approaches SO3 and SO4, which are considered to provide a more balanced delivery.

This overall assessment is captured in Table 6.12

Table 6-12. Overview assessment of Approaches - Strategic

Strategic Management Approach	SO1	SO2	SO3	SO4	
				SO3 element	Sand Scaping element
Balanced delivery of strategic objectives	--	-	+	+	++

In terms of what the Strategy aims to deliver at a strategic level, Strategic Management Approaches SO1 and SO2 would be rejected.

6.2.1.2 Adaptive Capacity

There is a strong emphasis now of resilience. While, at the coast in particular, this concept is complex, it may to a degree be reflected through:

- The ability for the approach taken to risk management to be integrated with broader aspirations for improving the use and opportunities for sustainable economic and environmental growth. This being in line with the vision expressed in the Neighbourhood Plans for reconnecting land and sea over the Mounts Bay area.
- Over the longer term, the concept relates more to the adaptive capacity in being able to respond to current uncertainties over aspects such as climate change and coastal behaviour.

These two aspects have been considered in looking at the adaptive capacity embedded within the different Strategic Management Approaches.

The conclusions drawn from the individual assessments are summarised below.

SO1 – Do Nothing
While over the very long term, allowing naturalisation of the coast effectively addresses the issue of how to respond to current uncertainties. Within the range of uncertainty with respect to such aspects as sea level rise the response would remain the same.

However, over the short term, and indeed over much of the period considered by the Strategy, there would be a major need for adaptation, with little opportunity to respond effectively to this need for change.

There is little adaptive capacity embedded within the Strategic Management Approach SO1.

SO2 – Sustain existing defences.
In the main areas of concern identified by the SMP, (i.e. The Promenade and the Eastern Green / Longrock frontages), embarking on a programme of sustaining the existing defences would severely constrain the ability to adapt to change and uncertainties or to consider opportunities for a more adaptive approach in the future, with the inherent risk of lowering beach levels driving the need for further piecemeal investment in linear defences.

Furthermore, by fixing the coast, increasing the separation between land and sea, there is little scope to integrate risk management with opportunities for regeneration and environmental growth.

There is little adaptive capacity embedded within the Strategic Management Approach SO2.

SO3 – Controlled Adaptation
Inherent within this Approach is the ability to modify the outline configuration of structures, integrating the design with the use of the area. Having, over the shorter term established the basic framework for defence, there would be scope for further adaption, more specifically within this basic structure developed for the Promenade. Over the Eastern Green / Longrock area, extending through to Marazion, while the Approach does provide some scope for future adaptation, this would be within the constraint imposed by the control structures.

SO4 – Controlled Adaptation with Sandscaping
As with Approach SO3, over the area of the Promenade there is scope for integrating further adaptation measures over the longer term.

The Sand Scaping approach to Eastern Green / Longrock offers potentially less opportunity for specific integration with land use but does open significantly greater connection, more generally, between land and sea, with opportunities for habitat restoration. Over the longer term the Approach provides a better basis for developing adaptation to the western area of Marazion, while imposing far less constraint on the physical management of the coast with respect to responding to future uncertainties. This allows consideration an adaptive pathway.

This comparative assessment is summarised in Table 6-13.

Table 6-13. Overview assessment of Approaches - Adaptive Capacity

Strategic Management Approach	SO1	SO2	SO3	SO4	
				SO3 element	Sand Scaping element
Adaptative Capacity	--	--	+	++	++

6.2.1.3 Economic

Damages

At the strategic level for each of the Do Something Strategic Management Approaches it is taken that defence would be improved to provide sustainable use of the area, providing an appropriate high standard of protection. As such it is assumed that there would be no residual damages (except as specifically considered in local areas). This assumption would need to be tested in developing schemes in each areas but provides a sensible consistent strategic baseline for assessing different Strategic Management Approaches.

The benefits of continuing to provide this standard of protection derive from the avoidance of damages set out in Table 6-1, with a total overall PVc benefit of £395M.

Economic Assessment

Each of the Do Something Strategic Management Approaches offer an economically justified approach to risk management but with varying Net Present Value and Benefit Cost Ratio compared to the Do Nothing baseline scenario (Approach SO1). This is set out in table 6-14 for the whole area.

Table 6-14. Economic Summary by Approach

	SO1	SO2	SO3	SO4
Do Nothing present value damages - PVd (£M)	394.70	-	-	-
Potential Residual damages - PVdr (£M)	-	0.37	0.37	0.37
Present Value benefits - PVb (£M)		394.33	394.33	394.33
Present Value Costs - PVc (£M)		93.14	110.21	97.57
Net Present Value - NPV (£M)		301.19	284.12	296.76
Benefit Cost Ratio - BCR		4.23	3.58	4.04

A comparison of Benefit Cost Ratio is shown in summary by local area in Table 6-15.

Table 6-15. Comparison of Benefit Cost Ratio by area.

Area	Benefit Cost Ratio (BCR)		
	SO2	SO3	SO4
Marazion (core)	3.22	3.22	3.22
Marazion (west)	0.85	2.17	3.05
Eastern Green / Longrock	4.91	3.65	4.82
Penzance Harbour	2.16	2.16	2.26
Promenade (including MR for FBG area)	3.34	2.47	2.47
Newlyn (including Tolcarne)	7.13	7.13	7.13
Mousehole and Coastal Rd.	6.26	6.26	6.26
Full Approach	**4.23**	**3.58**	**4.04**

Strategic Management Approach SO2 delivers the highest BCR, although as noted in the more detailed discussion, in all areas this Approach has a higher long term actual cash cost.

Considering the interaction between management of different areas, taking a wider view in terms of management of the northern section of Penzance Harbour, in combination with management of Eastern Green and the western part of Marazion, the BCR for Approach SO2 is 3.87, compared to that under Approach SO4 of 4.13, highlighting the wider influence and benefit of the Sand Scaping Approach. From an FCERM economic perspective, therefore, Approach SO4 (Sand Scaping) provides the preferred Approach in relation to the eastern frontages.

The most significant cost difference between Approaches is in relation to management of the Promenade area. This is reviewed in the discussion with respect to partnership funding below.

Overall, grading Approaches from a strictly economic perspective (Table 6-16), it is concluded that over the eastern frontages Sand Scaping (SO4) is the preferred Approach. However, with respect to the Promenade there would be the need to demonstrate additional broader scale benefits.

Table 6-16. Overview assessment of Approaches - Economic

Strategic Management Approach	SO1	SO2	SO3	SO4	
				SO3 element	Sand Scaping element
Economic Justification	--	++	+	+	++

6.2.1.4 Commercial

From a commercial perspective the Do Nothing Strategic Management Approach would be unacceptable and is unlikely to be deliverable in a coherent manner.

While the delivery of works under Strategic Management Approach SO2 would perpetuate current practice and would follow a traditional viable procurement route, there remains the concern that funding from various sources would still need to be developed in an *ad hoc* rather than fully planned manner. At present, funding has been typically had to be driven by emergency funding following storms.

With respect to the two large frontages of Eastern Green / Longrock and the Promenade, Strategic Management Approach SO3 would provide an agreed overall approach setting a clear framework and intent. As such, and with the intent to construct major strategic control structures, the development of specific schemes would be planned, allowing development of a short to medium term strong procurement route.

The process of procurement for Sand Scaping , under Strategic Management Approach SO4, would benefit from early selection of a contractor with the potential to programme construction around availability of specialist plant. Notwithstanding these matters, major sediment recharge has been undertaken successfully and effectively in other areas of the UK and poses no major challenge.

Overall, from a Commercial perspective SO4 introduces the need for further consideration but is not considered to be a significant barrier to delivery. The assessment of Approaches from this perspective is set out in Table 6-17.

Table 6-17. Overview assessment of Approaches – Commercial

Strategic Management Approach	SO1	SO2	SO3	SO4	
				SO3 element	Sand Scaping element
Commercial delivery	--	++	++	++	+

6.2.1.5 Financial

Table 6-18 sets out the potential FCERM Grant-in-Aid (GiA) contributions and potential requirement for Partnership Funding associated with each of the Strategic Management Approaches.

In terms of the two main Harbour areas, there is strong expectation, as part of collaborative funding, for management of the main Harbour structures to generate adequate partnership funding .

There are significant third-party assets at risk within the Eastern Green / Longrock area, with again a realistic expectation of partnership funding.

Table 6-18. Indicative assessment of requirement for partnership funding.

Area	Damages (OM1) £M	max GiA £M	SO2		SO3		SO4	
			PVc £M	Deficit £M	PVc £M	Deficit £M	PVc £M	Deficit £M
Marazion Core	7.08	2.46	*2.2*	-	*2.2*		*2.2*	
Marazion West	4.0	0.316	*4.7*	4.4	*1.84*	1.52	*1.31*	0.99
Eastern Green / Longrock	172.7	14.3	*35.2*	20.9	*47.37*	33.07	*35.83*	21.53
Penzance Harbour	28.53	6.9	*13.18*	6.28	*13.18*	6.28	*12.61*	5.71
Promenade	73.04	8.32	*22.14*	13.82	*29.9*	21.58	*29.9*	21.58
Newlyn	79.16	6.43	*11.1*	4.67	*11.1*	4.67	*11.1*	4.67
Mousehole	28.92	4.02	*4.62*	0.6	*4.62*	0.6	*4.62*	0.6
Totals	**393.43**	**42.75**	***95.99***	**53.52**	***110.2***	**67.7**	***97.6***	**55.1**

The main area of challenge will be in relation to the Promenade, where third-party funding is more focussed on regeneration and delivery of the aspirations of Place Shaping and the Neighbourhood Plan.

In this, it is considered that Strategic Management Approach SO3 (and by implication SO4) offers the greatest opportunity for sourcing such funding through collaborative integrated design, recognising the significant additional cost highlighted in Table 6-18. Strategic Management Approach SO2, offers little with respect to this apart from provision of basic protection.

An overall assessment can therefore be made with respect to the Strategic Management Approaches, summarised in Table 6-19

Table 6-19. Overview assessment of Approaches - Financial

Strategic Management Approach	SO1	SO2	SO3	SO4	
				SO3 element	Sand Scaping element
Financial delivery	--	-	+	+	++

6.3 Preferred Strategic Approach

The comparative assessments are collated in Table 6-20.

Table 6-20. Collation of Approach assessment.

Strategic Management Approach	SO1	SO2	SO3	SO4	
				SO3 element	Sand Scaping element
Balanced delivery of strategic objectives	--	-	+	+	++
Adaptive Capacity	--	--	+	++	++
Economic Justification					
Commercial delivery	--	++	++	++	+
Financial delivery	--	-	+	+	++

On this basis, it is concluded that Strategic Management Approach SO4 delivers best against key aspects of this assessment and is the preferred Strategic Management Approach for Mount's Bay.

The Sand Scaping element within Strategic Management Approach SO4 is clearly preferred for management of the eastern frontages. However, also by offering a different landscape and environment adding to diversity of use of the Mounts Bay area (complimenting that associated with the more formal approach taken to the Promenade), this Approach potentially opens opportunity for different partnership funding sources.

Approach SO2 fails to deliver in significant aspects in relation to the Strategic objectives, particularly failing to unlock barriers to development and growth, rigidly clamping down on the natural development of the coast and quite potentially leading management down an unsustainable FCERM pathway over the longer term.

6.3.1 Implications

There are significant implications associated with delivery of this preferred Strategic Management Approach SO4. Key issues are summarised as:

6.3.1.1 The need for partnership funding.

- The above assessment has been made over the full 100 year period of the Strategy. The preferred approach requires significant investment in risk management over the next 10 to 30 years. Typically, these costs may be broken down by area as shown in Table 6-21. This highlights the need for early discussion with potential partners with respect to the Eastern Green / Longrock area and the Promenade.

Table 6-21. Short term expenditure- Preferred approach.

Area	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure	
	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M
Marazion Core	0.09	0.1	0.47	0.89	0.34	0.84	0.89	1.83
Marazion West	0.03	0.04	0.03	0.06	0.01	0.02	0.08	0.12
Eastern Green / Longrock	0.09	0.12	28.29	43.62	0.2	0.56	28.58	44.3
Penzance Harbour	6.84	9.6	0.25	0.46	2.5	7.24	9.59	17.30
Promenade	5.24	7.32	19.15	32.33	2.96	8.3	27.35	47.96
Newlyn	3.8	5.32	2.48	4.16	0.5	1.26	6.78	10.74
Mousehole	0.06	0.07	1.88	3.35	0.18	0.5	2.11	3.92
Totals	**16.15**	**22.57**	**52.55**	**84.87**	**6.69**	**18.72**	**75.38**	**126.16**

- Under the preferred Approach, it is recognised that Newlyn Harbour gains significant benefit from the works being considered for the Newlyn Coombe River entrance. This should be explored in terms of partnership funding but importantly in the broader strategic context that the main Harbour structures provide significant benefit in terms of FCERM over the longer term.
- As part of the preferred Approach in the general area of the Promenade, proposed works identified by the preferred Strategy are provided in outline detail. This Approach needs to be developed further in a manner closely integrated with the broader aspirations for the area. This discussion needs to be progressed in the short term to ensure both that the Approach to FCERM maximises opportunities for regeneration while also maximising opportunity for partnership funding. Critically, it is anticipated that significant expenditure would be required over the next 10 years, potentially setting the direction of travel.

- A key partner for management of the Eastern Green / Longrock frontage would be Network Rail. Promoting the preferred approach internally within Network Rail would require specific more detailed economic and technical examination of the area. Network Rail have indicated that they would anticipate sustaining the current railway line over the next 30 years, with the potential for further investment similar to the recent development of the service depot. The Strategy provides a clear framework for FCERM management and would support internal discussion within Network Rail.
- From discussion with Penzance Harbour, the Harbour Authority is undertaking a detailed plan for future investment. Under the preferred Strategy it is anticipated that initial costs in the order of £7.2M may be required over the next 10 years. Harbour expenditure forms a key aspect of delivering the FCERM Strategy for the area. This needs to be discussed considering where there are synergies between Harbour operation and improvement in FCERM. This may be critical in terms of management and the potential modification of the approach to defence around the Headland area.
- Furthermore, as part of developing their long term strategy for Penzance Harbour, the Harbour Authority is considering opportunities for extending the area of the Harbour (discussed in Section 5.13). At present, the focus for examination is around the potential extension of the East/West breakwater shown in Figure 5-8. This breakwater has the potential to reduce FCERM expenditure over the area of the Headland, possibly affecting wave behaviour along the Albert Pier reducing pressure on the Pumping Station wall and potentially over the Chyandour area.

  Currently, the preferred Strategic Management Approach identifies the possible need for some £10.44M (PVc) investment in these two areas over the 100 year period. Clearly, change in the approach to management of the Penzance Harbour may generate significant savings in terms of FCERM, with the potential also for partnership funding. The FCERM investment profile indicates that there may be a requirement for some £2.8M (PVc) investment in the core area of Penzance Harbour over the next 10 years, increasing to around £9M (PVc) by Year 50.

6.3.1.2 Technical

- The Strategy has identified and allowed for addressing local immediate areas of concern at:
  - The entrance to the Newlyn Coombe River (currently being examined).
  - The eastern end of the Promenade
  - The flood risk under extreme events to the railway line at Chyandour
  - Improvement to the embankment within Marazion Marsh

  These areas now need to be considered further within the context of the preferred Strategy. Some of these areas are discussed below.
- The Strategy identifies significant risk to the integrity of Marazion Marsh. The preferred approach to management offers an opportunity to address this. The Water Level Management Plan, which is understood to be due for review, should take account of the conclusions of the Strategy.
- Significant savings might be made in provision of sediment recharge should a closer alternative sediment site be identified. At present, while it has been shown that there are no high-level “show stoppers”, significant further investigation would be required to establish whether the potential indicative site is viable. A significant decrease in cost of sediment would reduce the costs of the Sandscaping element of the preferred Strategy, also potentially reducing the cost of the adaptive approach for the Promenade through the reduced cost for local recharge. It would be recommended under the Strategy that a staged investigation of the alternative sediment source site is carried out.
- Alongside the above, further consideration should be given in refining the size and distribution of the Sand Engine. Specifically, this should look to refine the initial configuration of the Sand Engine balancing the need to retain sediment over the core area, while ensuring an adequate spread of

sediment to provide timely benefit to adjacent areas. Alongside this, there would be need to further examine the balance between initial supply volume and longevity in terms of defence of the core area and the need for frequency of renourishment.

- The works associated with the entrance to the Newlyn Coombe River have been considered as part of the Strategy and it is concluded that the proposed works are consistent with the aims of the Strategy. Therefore, the Strategy can be considered to set the context for further development of this urgently required scheme. Consideration should, as part of this, be given to local improvement to the structures at the entrance to the river.
- Associated with the above and more significantly with the development of the approach to management of the Promenade, further detailed development and examination of the configuration of control structures should be undertaken. While detailed decisions for management of the Foster Bolitho Gardens area can be deferred, consideration of how works across the main promenade area should take account of potential benefits that can be derived from the configuration of the main structures.
- Under the preferred Strategy as applied to the Promenade area, as a whole, further consideration needs to be given to the management of the Lariggan River outfall. By recommending a more adaptive managed realignment along the Foster Bolitho Gardens area, this creates the longer term opportunity for naturalisation of the Lariggan valley, without disrupting the continuity of defence along the shoreline. Further outline examination of this should be undertaken when developing the detailed approach for the Promenade.

6.3.1.3 Community Consultation and Engagement

The preferred Strategic Management Approach introduces significant change and opportunity for change, principally in the area of the Promenade and the eastern frontages. It is proposed to undertake both public and local consultation as part of the Strategy development process.

More specifically:

- While the need for change to the western area of Marazion is anticipated to be over the longer term, adapting to the changes proposed by the preferred Strategy Approach need to be considered at the earliest opportunity to avoid unnecessary investment and to ensure that longer term investment may be planned. This would require further engagement with the landowners, coastal users and the community.
- The changes along the Foster Bolitho Gardens frontage will affect current use of the area, alongside possible direct loss of amenity features. While actual change may not directly affect these interests immediately, as part of developing the broader approach to management along the Promenade, further initial engagement should be undertaken in identifying specific interests and ideas for the area.

6.3.1.4 Mitigation

The preferred Strategic Management Approach will result in major change to the area. Certain mitigatory measures should be considered in taking the Strategy forward in detail.

Source and supply

- Until more detailed examination of specific scheme options has been undertaken there remains uncertainty as to the overall impact associated with the use of rock armour, in particular with reference to the carbon cost discussed later. However, there is significant scope for influencing this during detail design. Specifically, certain factors are identified:
    - Rock type, although this is recognised to be constrained by availability and opportunity of local supply.
    - Distance to supply.

- Nature of transport.

- The Strategy requires placement of large volumes of sediment at the coast, over a range of different time periods. While constrained by both sediment availability and the physical nature of the sediment, consideration of alternative sources may give rise to substantial reductions in carbon cost. Similarly, at a detailed level, efficiency of plant used in the operation of sediment placement would be necessary. This also relates to the efficiency of undertaking operations in combination along different areas of the coast and in balancing the need for initial volume placement as compared to subsequent need for renourishment.

Carbon capture and diversity

- Several studies have considered how the use of rock within the coastal environment may be modified to encourage marine growth. Such approaches could be used to mitigate the impact on the environment due to the use of rock in any rock structure proposed by the Strategy. While the positive impact of this might be relatively small this should be considered further.
- Current studies are being progressed considering the opportunity for carbon capture through the creation of kelp or similar habitat such as seagrass. This is seen as significant opportunity in relation specifically to the construction of offshore and submerged rock structures and potentially in relation to opportunities for sand placement.
- Various techniques are being trialled considering the modification of concrete surfaces to encourage marine growth. While the majority of concrete structures, constructed as part of the preferred Strategic Management Approach, would be as crest defences, there is the potential to examine this approach at a more detailed stage.
- Placement of large volumes of sediment provides the opportunity to encourage dune growth at the back of the beach. Encouraging such growth provides potential opportunity in terms of reducing the effects of wind-blown sand and sand loss, encouraging more diversity of habitats and potential for carbon capture.

7 Implementation of the Preferred Strategic Approach

The Preferred Strategy sets out an approach to management from the present over the next 100 years, looking to establish an approach that can be developed in a sustainable manner over and beyond that period of time.

Obviously, even over a shorter time period there remains a degree of uncertainty, in terms of the impacts of climate change (in particular the rate of sea level rise), in terms of coastal behaviour and deterioration of existing defence and in terms, ultimately, relating to the use of the area. The Preferred Approach (The Strategy) aims to take account of these uncertainties, with the aim to encourage a land use (Place Making) led approach, with risk management needing to set a clear framework within which the important economic factors, environmental growth and well-being and security of communities can be addressed and developed.

Notwithstanding the need for this broader land use led approach, this is not open ended. The Strategy identifies critical constraints on how we might manage the use of the area. A key item includes how reliance and perpetuation of the current approach to defence of the Promenade frontage actually constrains opportunity for reconnecting land and sea and in the way in which the current linear approach to management of the Eastern Green / Longrock area would have severe impacts on the shoreline behaviour.

There is, therefore, a clear need for change. The Preferred Strategic Management Approach attempts to achieve a deliverable balance between sustaining an appropriate standard of protection (risk management) alongside opening opportunity to sustain and enhance the important natural, the historic and cultural environments, while also delivering a framework within which improvements may be developed for economic regeneration.

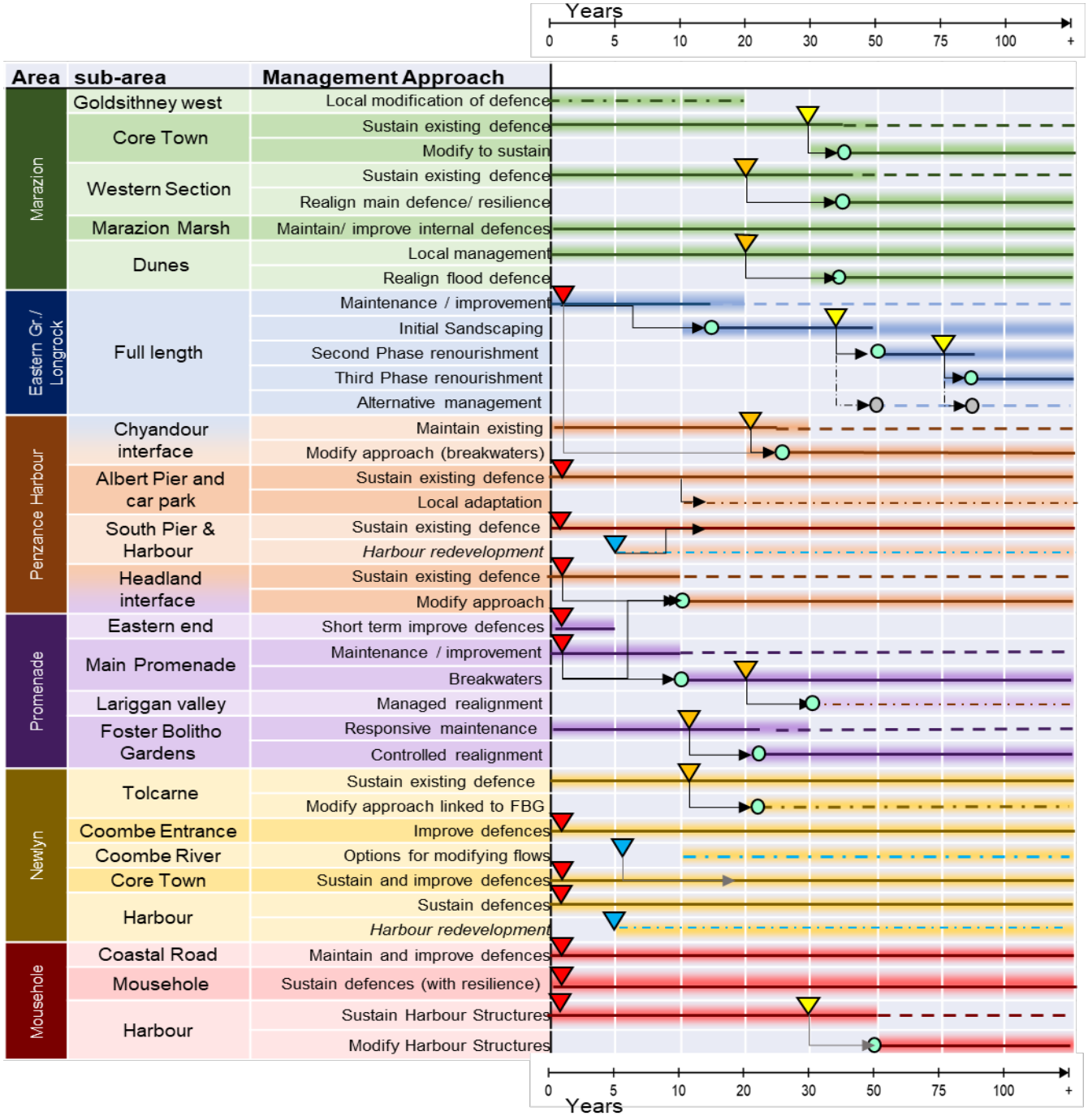
The Preferred Strategy identifies certain decisions that have to be made now. The Strategy sets out in outline the preferred approach and this will need to be developed in detail with various stakeholders, considering how:

- The outline approach may be further developed to maximise opportunity for integrating with other emerging plans,
- Potential impacts identified through the SEA may be mitigated,
- Opportunities for enhancing the natural environment may be developed, and
- Collaborative funding packages are developed.

In other areas, some detailed decisions may be deferred. This recognises longer term uncertainties, particularly in terms of timescales, but also allows discussion with local communities as to how the Strategy may be refined in detail. In such areas, the Strategy discusses different outcomes and sets out a preferred approach but recognises that this will need to be discussed further. Notwithstanding this opportunity to defer detailed development of the Strategy, it is important that these issues are raised now, allowing time for discussion and to allow people to plan how change may affect them.

The Preferred Strategy, therefore, sets out an overall Plan for management but incorporates future opportunity for further adaptation. This Adaptive Pathway is set out in Figure 7-1, highlighting actions that need to be taken but equally showing where the Strategy needs to be refined in detail as the Strategy is developed.

This current document is presented as a Draft for Consultation. Some of the issues covered by this section of the report will be finalised following a period of public consultation.



Key

Strategy Pathway

- Marazion
- Eastern Gr. / Longrock
- Penzance Harbour area
- Promenade
- Newlyn (Tolcarne)
- Mousehole

Change from existing

- Local adaptation considered within Strategy
- External influence on Strategy
- Strategy decision
- Deferred decision for early consultation
- Longer term decision
- External decision influencing strategy
- Change point

Note: The pathway recognises that development opportunities associated with the two main Harbours may influence the Strategic Approach to FCERM within the Penzance and Newlyn areas. The pathway highlights when decisions with respect to Harbour redevelopment might be required to allow integrated management.

Figure 7-1. Adaptive Pathway

7.1 Delivery and Engagement

The Strategy sets out a plan for management over the whole area, identifying important interdependencies between frontages both in terms of delivery of risk management but also in terms of broader diversity of use and value. Within the context of this overall plan, however, there are important local matters that need to be addressed. These are highlighted below.

7.1.1 Marazion and Marazion Marsh

Over the short term, management would effectively continue as at present. Over the medium to longer term, over the **core part of the Town** the existing defences would be maintained with future decisions being made how these defences might need to be modified in response to sea level rise.

This sets the context for reviewing management of the interface between the core part of **the Town and the western end of Goldsithney Bay**. Locally and more immediately, there is the issue of the pumping main. This needs to be resolved in discussion with South West Water, taking account of:

- The overall intent to allow the natural erosion of the Goldsithney Cliffs,
- The longer term protection to the road and properties set back within the coastal slope behind the cliffs.

This local issue is discussed within Appendix C1.

The **western part of the Town and Dunes** will come under increased pressure for erosion. This will be mitigated to a significant degree by introducing additional sediment supply as a result of Sand Scaping (Eastern Green / Longrock). Even so, over the medium term (30 to 40 years) increasing water levels with sea level rise will pose a significant risk to the area and the integrity of the Marazion Marsh.

The Preferred Strategy identifies the need to plan for adaptation, considering options for controlled realignment, set back defences and/or the potential need for property level resilience measures. This will also influence how internal defences within **Marazion Marsh** are managed.

There is the need for:

- Early discussion with the community, stakeholders and landowners, raising awareness of these issues and allowing forward planning of how to respond.
- Incorporation of the need for adaptation within development of plans for the Coast Path.
- Consideration of the issues raised by the Strategy and the implications of the Strategy within the development of the Water Level Management Plan for Marazion Marsh.

In addition, the area of the Marazion Dunes, in particular, is being examined under Cornwall's Making Space for Sand project. This project, taking account of the issues raised by the Strategy, will feed back further information on the area, which will assist in the above conversations.

Other issues.

- The SEA has identified potential impacts:
    - Wind-blown sand. Further investigation would be required considering potential impact of wind-blown sand on Marazion Marsh. This should be considered both in terms of mitigation alongside consideration of how wind-blown sand allows the natural development of the dunes.
    - Intertidal and nearshore smothering. Further investigation would be required considering the mitigation of potential smothering during detailed design.
- Opportunities. The opportunity should be considered for further development of seagrass extent.

Costs

Estimated costs for management of the Marazion area are set out in Table 7-1. The table shows the indicative short term expenditure over the next 10, 10 to 20 and 20 to 30 years. Alongside this, the Table provides an assessment of overall possible FCERM grant-in-aid (GiA) taken over the full 100 year period and, therefore, the requirement for partnership funding (based on values shown in Table 6.18).

Table 7-1. Estimated investment profile for the Marazion area

Area	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure		Long term (100 yr. Strategy) Indicative PV		
	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	Benefits £M	GiA £M	Deficit £M
Marazion Core	0.09	0.1	0.47	0.89	0.34	0.84	0.89	1.83	7.08	2.46	
Marazion West	0.03	0.04	0.03	0.06	0.01	0.02	0.08	0.12	4.0	0.32	0.99

7.1.2 Easter Green / Longrock

Under the Preferred Strategy, future management of this area would be based on a Sand Scaping approach. There would be a need to maintain existing defences over the short term during the detailed development and design of the longer term approach.

Where there is the need for such short term works, possibly due to storm damage, repair work would be undertaken on that short term basis, with the intent for construction of the Sand Engine within the next 12 years.

Delivery of the preferred Approach will require collaborative funding including working with Network Rail and service providers, developing on initial discussions undertaken as part of developing the Strategy. This would require early engagement, providing the opportunity for organisations to identify and undertake their own internal assessment of the need for investment.

As part of this, there would be the need to further consider the impact on outfalls and the need for the impact on these to be mitigated through design of the Sand Engine.

Modelling has been undertaken demonstrating the viability of the approach. This would need to be developed further, refining both the shape and size of the Sand Engine, optimising the volume against the anticipated residual life of critical protection.

Associated with this would be the need to consider:

- The width of upper beach, providing opportunity for use of the area and integration with the developing plans for the Coast Path (with the potential opportunity for further collaborative funding).
- The need to mitigate any potential for smothering of the nearshore area. (This has been considered in the initial modelling showing that such smothering is unlikely. However, this will continue to be a critical constraint during detailed design.)
- The potential opportunity for enhancing features of the County Wildlife Site, in particular considering the development of backshore dunes.
- The potential need to mitigate the risk of severe windblown sand.
- The need to maintain and enhance the supply of sediment through to the Marazion area.

Possible sources of sand have been considered in outline. This would need to be examined further. In particular, there is the potential for considering alternative closer sites. As part of developing the design

further investigations would be required, confirming the potential extent of an alternative site together with further examination of potential environmental impacts. This might be developed in stages.

Key issues with respect to sourcing sediment would be costs and carbon footprint, alongside consideration of availability of volume and the potential synergy with sediment supply required for the Promenade area. This may influence the timing of schemes covering the two different areas.

Other issues.
In addition to potential mitigation measures noted above, there is the potential opportunity for extending the area of seagrass, developed either as an integral part of the scheme or as an opportunity for further consideration.

Costs
Estimated costs for management of this area are set out in Table 7-2. The table shows the indicative short term expenditure over the next 10, 10 to 20 and 20 to 30 years, alongside an assessment of overall possible FCERM grant in aid (GiA) and requirement for partnership funding (based on values in Table 6-18).

Table 7-2. Estimated investment profile for the Eastern Green / Longrock area

Area	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure		Long term (100 yr. Strategy) Indicative PV		
	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	Benefits £M	GiA £M	Deficit £M
Eastern Green / Longrock	0.09	0.12	28.29	43.62	0.2	0.56	28.58	44.3	172.7	14.3	21.53

7.1.3 Penzance Harbour

On-going management of the main harbour structures is critical to managing flood and coastal erosion risk across wider the Penzance Harbour area. As such there needs to be a co-ordinated and collaborative approach, recognising joint benefits and the need for collaborative funding. At present the Harbour Authority are developing their plan for management and it would be intended that the Preferred Strategy feeds into this. Associated with this, the area includes one of the main Penzance car parks, the bus station, the railway station and the main pumping station. In addition, the Harbour provides one of the principle links to the Isles of Scilly.

The Preferred Strategy is for continued management of existing defences. The area needs a clear funding plan developed in discussion with owners and operators of the above assets. In relation to service providers and Network Rail this needs to be considered alongside potential funding requirements for the Eastern Green / Longrock area.

Alongside this, there are emerging plans, considering possible options for developing the use of the Harbour. This may have a significant influence on future management of the whole area. While it is understood that some of the more major plans have been put on hold, there may be opportunities being considered in relation to Harbour development seaward of the South Pier.

Based on the assessment of existing defences and structures, there is a critical period over the next 10 years, where more major works might be required to sustain defence to the area. As such, there is a degree of urgency associated with the conclusion of plans for the Harbour, if joint planning is to be achieved.

Over the northern part of the Harbour area (**Chyandour**), under the Strategy, there is an expectation that there would be the need for some on-going improvements to defences to improve the current standard of defence. Over the longer term, it is probable that more major works would be required in response to sea level rise (typically in 20 to 30 years). The Strategy identifies the potential benefit created by the Sand Scaping approach, whereby using some form of breakwaters needs to be considered in the Chyandour area as the Strategy is taken forward.

More immediately, at the **Headland**, the Strategy identifies the potential for incorporating works to improvement protection to the Headland and the root of the South Pier alongside developing the approach to management of the Promenade. This alternative approach potentially reduces the need to raise defences in the Headland area and may be considered preferable in relation to use and visual impact on this area. This would need to be developed through consultation.

In the area of **the car park and pumping station**, within the context of the overall Strategy to sustain the principle structures, there may be scope to adapt flood (overtopping) defence to the crest of these main structures. This provides the opportunity for a more integrated approach in design of improvements to the Coast Path.

The main emphasis within the Strategy is to engender a joined up approach for future management of the area, within which the specific areas can be considered as part of developing from the Strategy.

Other issues

The Strategy does highlight concerns with respect to the visual impact of any works and this needs to be considered in detail.

While the Strategy is unable to deliver any substantive change in terms of habitat creation, in considering the detailed design of different elements of work, consideration should be given to local enhancement of hard structures (greening).

Costs

Estimated costs for management of this area are set out in Table 7-3. The table shows the indicative short term expenditure over the next 10, 10 to 20 and 20 to 30 years, alongside an assessment of overall possible FCERM grant-in-aid (GiA) and requirement for partnership funding (based on values in Table 6-18).

Table 7-3. Estimated investment profile for the Penzance Harbour area

Area	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure		Long term (100 yr. Strategy) Indicative PV		
	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	Benefits £M	GiA £M	Deficit £M
Penzance Harbour	6.84	9.6	0.25	0.46	2.5	7.24	9.59	17.30	28.53	6.9	5.71

7.1.4 The Promenade

The Preferred Strategy sets out the need and opportunity for major changes to management across the whole Promenade area.

Overall, the approach, while critically still providing an appropriate standard of protection to the important features of the area, offers a significantly different manner in which this protection is provided. The

opportunity now needs to be taken to properly integrate this with the emerging plans for developing the use and regeneration of the main Promenade.

Over the main area of the Promenade (**Jubilee Pool to the Lariggan Outfall**) the approach delivers a series of breakwaters and shore-connected structures, including, in outline, the use of a major submerged breakwater structure. This changes the wave exposure on the existing sea wall but also creates different landscape features, areas where some level of upper beach may be recharged and retained and opportunity to create different forms of access between the promenade and the foreshore.

To a degree, the form and position of structures may be adjusted and it is this ability to adapt the outline approach that needs to be developed through detailed design both in FCERM delivery and in terms of how this enhances the uses envisaged for the Promenade. This is likely to be an iterative process and requires involvement of the local community and the Place Making Group, developing on the concepts set out in the Neighbourhood Plan.

This needs to be considered now, with the intent for works to be undertaken within the next 10 years, avoiding the need for major repair works to address current problems associated with the existing defences. There may be some latitude in this timescale but this would need to be considered in detail, potentially accepting the increasing risk to existing structures as a result of storm damage. As such, there may be scope for adjusting the timescale for delivery of the major scheme and this needs to be considered alongside the proposed works to the Eastern Green / Longrock area, developing a broadscale delivery plan for works proposed by the Strategy over the whole area. This would need to consider both:

- Opportunities and synergies in terms of construction (e.g. relating to delivery of sediment recharge).
- A sustainable investment plan, including integration of funding sources.

Neither this approach, defined by the Strategy, for the Promenade nor, indeed, an approach based solely on sustaining the existing defences, would be able to be delivered without significant level of partnership funding. Therefore, as part of developing an integrated approach would be the need to establish a wider funding plan.

Over the short term (over the next 5 to 10 years), there is the potential need to locally improve the standard of protection along the **eastern section of the main Promenade**. The need for this requires detailed consideration but within the context of the more major changes being proposed by the Strategy.

The Strategy has identified that there would be little justification for maintaining the existing defences over the **Foster Bolitho Gardens frontage**. There is, however, the opportunity to mitigate the impact of this on the use and development of this area, with the potential to create a wider upper beach transitioning through to the open area of grass behind. The intent, under the Strategy, would be to continue to sustain the important road to the back of the open area.

The need for realignment may not occur for 20 years. This period of time provides the opportunity for further discussion of how this area might be managed. However, this discussion needs to commence now, ensuring that the issues associated with future managed realignment of the Foster Bolitho Gardens area are included as the scheme for the main Promenade area is developed in detail. It is essential that the scheme for the main Promenade takes account of the transition through to management of the Foster Bolitho Gardens area.

Similarly, the detailed development of the main Promenade scheme needs to address the current issues associated with management of the **Lariggan Outfall**, while not closing down the opportunity for allowing increased tidal ingress within the **Lariggan Valley**.

The Strategy recognises that the potential for opening up the valley to tidal influence remains a longer term ambition, requiring significant discussion of local issues. However, it is important that this option is not closed down by more immediate works or as a result of development. This area and this option needs, therefore, to be raised now as part of current development planning.

Other issues

The Environment Agency is currently exploring opportunities for incorporating habitat creation such as promoting kelp growth within the construction of rock structures. The approach to management of the Promenade area clearly provides a significant opportunity for development of such an approach. This needs to be considered as part of any scheme design.

While there may be more limited opportunity for enhancing the extent of seagrass within this direct area, this should be examined in detail.

Costs

As identified above the cost of continued flood and coast protection within this area will be a major issue and will require significant partnership funding.

Estimated costs for management of this area are set out in Table 7-4. The table shows the indicative short term expenditure over the next 10, 10 to 20 and 20 to 30 years, alongside an assessment of overall possible FCERM grant-in-aid (GiA) and requirement for partnership funding (based on values in Table 6-18).

Table 7-4. Estimated investment profile for the Promenade area

Area	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure		Long term (100 yr. Strategy) Indicative PV		
	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	Benefits £M	GiA £M	Deficit £M
Promenade	5.24	7.32	19.15	32.33	2.96	8.3	27.35	47.96	73.04	8.32	21.58

7.1.5 Newlyn and Tolcarne

As with Penzance Harbour, on-going management of the main harbour structures is critical to managing flood and coastal erosion risk across wider the Newlyn area. As such there needs for a co-ordinated and collaborative approach, recognising joint benefits and the need for collaborative funding. The Harbour Authority have recently been considering future development of the important Harbour. Future development plans need to be considered alongside implementation of the Preferred Strategy.

The Strategy has identified the important role the main Harbour structures play in delivering flood and coastal erosion risk management. However, the management of flood and coastal erosion risk, particularly in the area around the entrance to the Newlyn Coombe River also delivers significant benefit to the operation of the Harbour in acting to sustain the integrity of the root to the North Pier and operational access to the Pier. This highlights the importance of having a co-ordinated approach to collaborative funding extending beyond specific funding of individual schemes.

Detailed options for the management of the **Newlyn Coombe River entrance**, are currently being examined. The Strategy identifies that on-going management of improvements to protection in this area are fully in line with the broader strategic approach and are fundamental to the delivery of the wider on-going benefits identified by the Strategy. Critically, delivery of an appropriate scheme creates the situation whereby operation of the Harbour is sustained, which in turn delivers the wider flood and coastal erosion benefits to the core part of Newlyn. Associated with this, on-going management of the entrance to the river provides the baseline for future sustainable management of the Tolcarne area.

Further consideration would be needed in looking at options for maintaining defence to **Tolcarne** and, while this is something that needs to be considered over the slightly longer term (typically in Year 20), this needs to be considered alongside the potential synergy associated with the development of future planned management of the Foster Bolitho Gardens area. (This is discussed further in Appendix C3.)

Under the Preferred Strategy, the intent would be to continue to sustain defence to the **core part of Newlyn Town**. Associated with this and addressing the issue of flooding from the **Newly Coombe River**, further consideration needs to be given to upstream storage options.

Other issues

The Environment Agency is currently exploring opportunities for incorporating habitat creation such as promoting kelp growth, within the options for management of the Newlyn Coombe River. On-going development of this opportunity would feed into similar considerations for management of the Promenade area.

While the Strategy in unable to deliver any substantive change in terms of habitat creation, except potentially that associated with storage within the Newlyn Coombe River Valley, in considering the detailed design of different elements of work, consideration should be given to local enhancement of hard structures (greening).

Costs

Estimated costs for management of this area are set out in Table 7-5. The table shows the indicative short term expenditure over the next 10, 10 to 20 and 20 to 30 years, alongside an assessment of overall possible FCERM grant-in-aid (GiA) and requirement for partnership funding (based on values in Table 6-18).

Table 7-5. Estimated investment profile for the Newlyn area

	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure		Long term (100 yr. Strategy) Indicative PV		
Area	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	Benefits £M	GiA £M	Deficit £M
Newlyn	3.8	5.32	2.48	4.16	0.5	1.26	6.78	10.74	79.16	6.43	4.67

7.1.6 Mousehole and Coastal Road

The overall intent of the Preferred Strategy is to sustain and improve existing protection to this area.

In relation to **the Coastal Road**, the intent would be to progressively improve existing defences as they deteriorate, maintaining access to Mousehole and to the local communities situated along the route of the road. Where currently there are no defences, while there are areas of local erosion, there is no apparent strategic risk and the intent would be to allow the cliff line to respond naturally.

There would be the need for on-going monitoring of defences, with the aim to develop a longer term plan for maintenance and improvement.

Local protection measures are being considered in relation to areas of **Mousehole Village**. In particularly there may be the need to consider local resilience measures to address the current risk. Management of the broader scale risk depends critically on the main Harbour structures and management of these structures needs to be discussed with the Harbour Authority.

In the longer term, potentially over a 40 to 50 year timescale, there is likely to be the need to modify and improve the protection provided by the main Harbour structures.

Other issues

The Strategy aims to allow the natural development of the undefended cliffs along the road. In other areas, the Strategy does not specifically identify other opportunities for significant habitat creation. Consideration should, however, be given to local enhancement of hard structures (greening).

Costs

Estimated costs for management of this area are set out in Table 7-6. The table shows the indicative short term expenditure over the next 10, 10 to 20 and 20 to 30 years, alongside an assessment of overall possible FCERM grant-in-aid (GiA) and requirement for partnership funding (based on values in Table 6-18).

Table 7-6. Estimated investment profile for the Mousehole area

	0 to 10 years		10 to 20 years		20 to 30 years		Total short term expenditure		Long term (100 yr. Strategy) Indicative PV		
Area	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	PVc £M	Cash £M	Benefits £M	GiA £M	Deficit £M
Mousehole	0.06	0.07	1.88	3.35	0.18	0.5	2.11	3.92	28.92	4.02	0.6

7.2 Management of the Strategy

The management of the area is complex, involving and developing an overall approach taking account of the interdependencies between different areas and setting a wider framework; based on the need for continuing flood and coastal erosion risk management, but highlighting how this interplays with the broader aspirations for environmental growth across the full extent of Mount's Bay.

Significant investment is planned under the preferred Strategic Management Approach over the next 10 to 30 years, with the need for on-going co-ordination and discussion with other organisations, communities and specific stakeholders, alongside consideration of the synergies between the development of local schemes as discussed above.

It is envisaged that overall management of the Strategy would sit with Cornwall Council in close collaboration with the Environment Agency. As part of the final approval of the Strategy a Strategic Outline Case (SOC) would be submitted to the Environment Agency.

Subsequent to this, Outline Business Cases would be submitted covering different elements of the Strategy.

Alongside this, it is envisaged that, under the overall co-ordination of a Strategic Board, more local management groups might be formed, allowing the discussion and development of the Strategy taken forward in collaboration with communities and other stakeholders.

7.3 Summary of proposed works programme.

An initial works programme is set out in Table 7-7 for the principle short term investment areas, highlighting key interactions.

Table 7-7. Short to Medium Term works programme

Location	Timescale/ Actions	Notes
Easter Green / Longrock	10 years Principally maintenance and local support	Local programme of works with the opportunity to extend period before Sand Scaping
	20 years Sand Engine in year 12	Need for collaborative funding Consideration of synergy with recharge for Promenade
	30 years Low maintenance through to year 45 (renourishment)	
Penzance Harbour	10 years Local improvement to defence and address flooding to car park area.	Local OBC
	10 to 20 years Major improvement to harbour structures. Improve defence to Headland	Need for collaborative funding Consideration of possible Harbour development. Strategic decisions over management to headland with potential synergy with Promenade
	20 to 30 years Major improvement to Chyandour defences	Need for collaborative funding Strategic decisions over modified defence approach with synergy with Sand Scaping.
Promenade	10 years Local improvement to eastern end	Local OBC taking account of longer term approach.
	10 to 20 years Major control structures (years 10 to 15) with recharge (year 15)	Need for collaborative funding Integration with regeneration and place making. Synergy with sediment supply with the need to review timing in association Sandscaping.
	20 to 30 years Submerged breakwaters FBG (year 30) (renourishment year 35)	Development of management approach to FBG and decision over Lariggan River valley
Newlyn	10 to 20 years Stub breakwater. Improve defence to entrance and to river	Local OBC developed in association with Newlyn Harbour Authority.
	20 years Maintenance	
	20 to 30 years Strand road improvements (year). (Major Harbour works in years 45 to 50).	Discussion of collaborative funding. Local OBC
Mousehole	10 years Resilience measures (Wharf Rd.)	Local OBC
	10 to 20 years Significant repairs to road walls (year 15 to 20). General improvement of defences.	Planned management
	20 to 30 years Major repairs to harbour structures (years 30 and 40).	Partnership funding.

7.4 Reconciliation with the SMP

The on-going overarching shoreline management process sets out high level policy for management of the area. In line with the recent SMP Refresh programme, the Strategy has reviewed current policy with the aim to ensure that the SMP remains current and reflects further detailed information. The opportunity is also provided to add clarity to the SMP policy statements.

7.4.1 Current Policy

Current SMP policy is set out in Table 7-8, with reference also to Figure 7-2 showing the extent of policy units.

Table 7-8. Current SMP policy

Policy Unit		SMP2 Policy Plan		
		2025	2055	2105
19.1	Undefended Cliffs (including southern part of Mount)	NAI	NAI	NAI
19.2	Marazion east (Venton Cove)	NAI	NAI	NAI
19.3	Marazion Town	HTL	HTL	HTL
19.4 (a)	St Michael's Mount - Causeway	HTL	NAI	NAI
19.4 (b)	St Michael's Mount – Harbour	HTL	HTL	HTL
19.5	Marazion west (Chapel Rock to Marazion Bridge)	HTL	HTL	HTL
19.6	Marazion Marsh	HTL	HTL	HTL
20.1	Longrock	HTL	MR	MR
20.2	Eastern Green	HTL	MR	MR
20.3	Chyandour	HTL	HTL	HTL
21.1	Penzance Harbour & Docks	HTL	HTL	HTL
21.2	Wherry Town	HTL	MR	MR
21.3	Newlyn	HTL	HTL	HTL
21.4	Sandy Cove	NAI	NAI	NAI
22.1	Cliff Road	HTL	HTL	HTL
22.2	Mousehole	HTL	HTL	HTL

7.4.2 Reconciliation with the Preferred Strategy

The Strategy has been developed in line with the intent set out in the SMP, aiming to address issues raised by the SMP and reconciling areas of uncertainty. In some areas, boundaries have altered in detail based on the reassessment of coastal processes, with, in some areas, changes being proposed to the sequence of policies or to the actual headline policy.

These proposed changes are discussed below, with sub-categories being included for clarity in accordance with the SMP Supplementary Guidance (2021. Under the new guidance, epochs set out in the SMP have been replaced by the terms: *Present, Intermediate and Target*, reflecting the on-going management process.

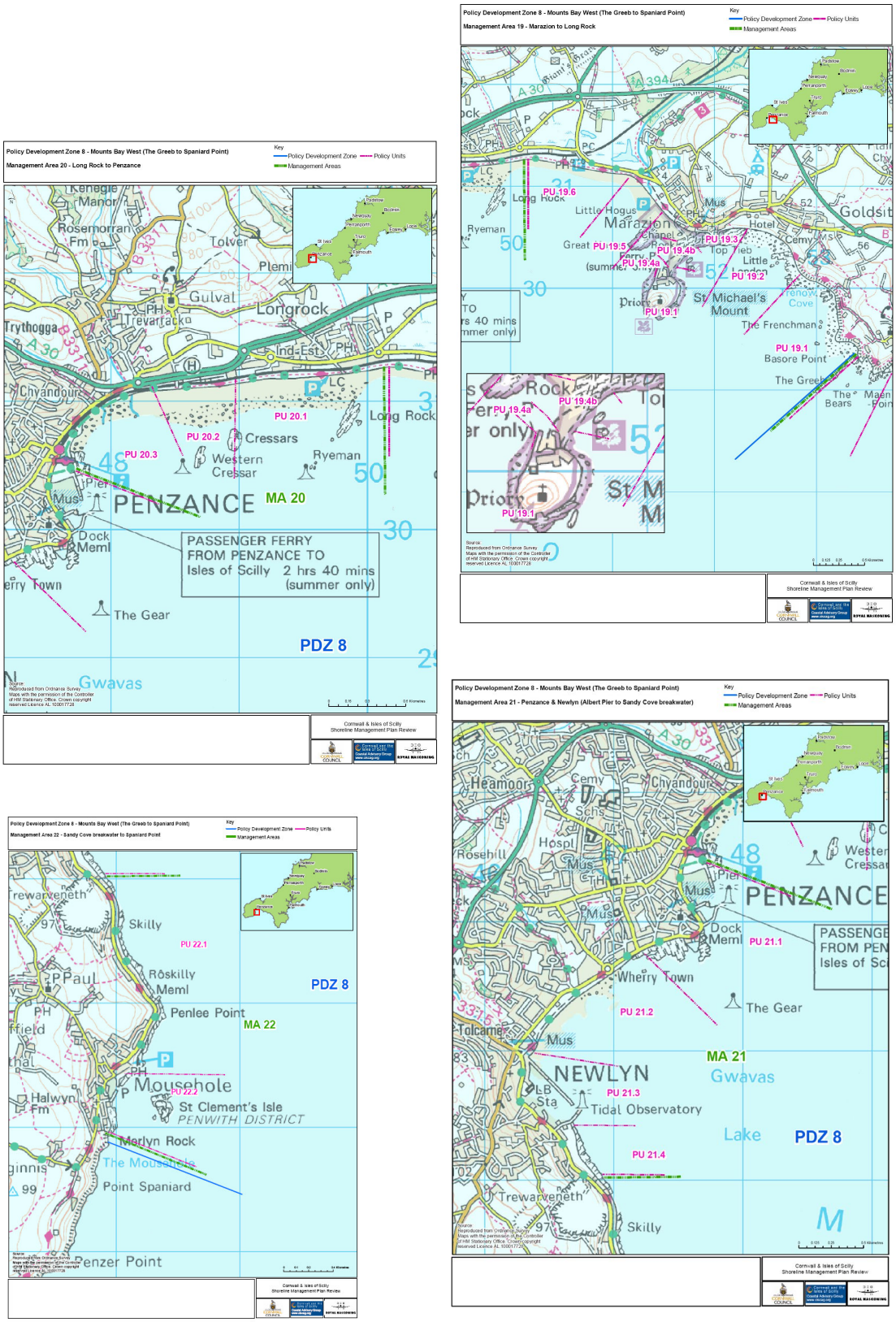


Figure 7-2. Extent of current SMP policy units

19.1	Undefended Cliffs (including southern part of Mount)	Current policy:	NAI	NAI	NAI
Discussion:		No change			
The SMP identifies this area as being an important supply of sediment with NAI meeting AONB objectives.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	NAI	Do not Defend	In line with AONB objective.		
Intermediate	NAI	Do not Defend	As above		
Target	NAI	Do not Defend	As above		

19.2	Marazion east (Venton Cove)	Current policy:	NAI	NAI	NAI
Discussion:		Proposed change to Target policy			
The SMP identifies the need to consider a transition zone between the NAI over the main part of the unit and the HTL policy to Marazion. The Strategy recognises this with the need to development local management taking account of the risk to the pumping main with the longer term risk to property and the road. On this basis for clarity it is proposed that the Target policy is amended to MR – Slow erosion, recognising that this would need to be reviewed in detail.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	NAI	Local Activity Only	In line with AONB objective but recognising the need for a transition zone		
Intermediate	NAI	Local Activity Only	As above		
Target	MR	Slow Erosion	Potential risk to road and property.		

19.3	Marazion Town	Current policy:	HTL	HTL	HTL
Discussion:		No change			
The SMP policy is confirmed by the Strategy					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Maintain / Replace	Defence on important community		
Intermediate	HTL	Maintain / Replace	As above		
Target	HTL	Maintain / Replace	As above		

19.4 (a)	St Michael's Mount - Causeway	Current policy:	HTL	NAI	NAI
Discussion:		No change			
The SMP policy recognises impact of sea level rise reducing use of the Causeway.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Maintain / Replace	Maintains short term connectivity		
Intermediate	NAI	Cease to Maintain	Avoids impact on coastal processes		
Target	NAI	Cease to Maintain	As above		

19.4 (b)	St Michael's Mount – Harbour	Current policy:	HTL	HTL	HTL
Discussion:		No change			
Maintenance of western harbour arm and protection of harbour area as remaining access route to and from St Michael's Mount.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Maintain / Replace	Maintain connectivity		
Intermediate	HTL	Maintain / Replace	As above		
Target	HTL	Maintain / Replace	As above		

19.5	Marazion west (Chapel Rock to Marazion Bridge)	Current policy:	HTL	HTL	HTL
Discussion:		Change proposed to intermediate policy			
The Strategy highlights the increased pressure on the frontage and the longer term issue that raising defences would impact on use of the area, coupled to funding issues relating to HTL. It is proposed that some form of realignment is undertaken that needs to be developed in detail through engagement with the community.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Repair not Replace	Maintain use and protection to property		
Intermediate	MR	Set Back Defence	Adapt defences to a more sustainable approach		
Target	HTL	Maintain / Replace	Maintain and improve modified approach to defence		

19.6 (a)	Marazion Marsh	Current policy:	HTL	HTL	HTL
Discussion:		Add new policy unit distinguishing between Marsh and Dune (open coast).			
The SMP recognised the need to protect the integrity of the Marsh, recommending that further study is undertaken. This further study is to be completed through the Strategy. The Strategy effectively separates the management of the integrity of the Marsh, which would be considered in detail, in the context set by the Strategy, through the Water Level Management Plan for the Marsh. In principle, the internal management of the Marsh would be for HTL, while recognising the need for change in management over the open coast. This is considered to be in line with the intent of the SMP.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Maintain / Replace	Maintain integrity of Marsh		
Intermediate	HTL	Set Back Defence	As above		
Target	HTL	Maintain / Replace	As above		

19.6 (b)	Marazion Dunes	Current policy:	HTL	HTL	HTL
Discussion:		Add new policy unit distinguishing between Marsh and Dune (open coast).			
The Strategy effectively separates the management of the integrity of the Marsh (PU19.6(a)) and that of the Marazion Dunes. Under the Strategy, the development of the Dunes would be supported by the introduction of additional sediment. While this would reduce the need for management, the intent would be to sustain the protection the Dunes provide to the road and the Marsh. This is considered to be in line with the intent of the SMP, however, under the new guidance the headline policy description would be MR. At present (over the short term) the intent would be to HTL should there be severe storm damage.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Repair not Replace	Maintain integrity of Marsh and road		
Intermediate	MR	Natural Features	Allow natural development of the Dunes providing protection		
Target	MR	Natural Features	As above		

20.1	Longrock	Current policy:	HTL	MR	MR
Discussion:		No change in policy but modify approach to protection			
The SMP recognised the need to address the risk to the transport network and the wider hinterland, while examining alternative approaches to management which address the unsustainable nature of long term linear defences. This further examination has been undertaken through the Strategy, confirming the issues raised by the SMP and developing a more sustainable and adaptive approach based on the principles of major sediment recharge. This approach is considered to be in line with the intent of the SMP, creating a more natural approach to					

management. The future behaviour of the shoreline will be kept under review but this approach is considered to provide a long term target approach.			
Proposed policy (SMP Tracker)			
Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Repair not Replace	Maintain protection to area.
Intermediate	MR	Natural Features	Modify approach to protection with major sediment recharge.
Target	MR	Natural Features	As above

20.2	Eastern Green	Current policy:	HTL	MR	MR
Discussion:		No change in policy but modify approach to protection			
The SMP recognised the need to address the risk to the transport network and the wider hinterland, while examining alternative approaches to management which address the unsustainable nature of long term linear defences. This further examination has been undertaken through the Strategy, confirming the issues raised by the SMP and developing a more sustainable and adaptive approach based on the principles of major sediment recharge. This approach is considered to be in line with the intent of the SMP, creating a more natural approach to management. The future behaviour of the shoreline will be kept under review but this approach is considered to provide a long term target approach.					

Proposed policy (SMP Tracker)			
Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Repair not Replace	Maintain protection to area.
Intermediate	MR	Natural Features	Modify approach to protection with major sediment recharge.
Target	MR	Natural Features	As above

20.3	Chyandour	Current policy:	HTL	HTL	HTL
Discussion:		Change intermediate policy to reflect potential opportunity to modify defence.			
The SMP recognised the need to address the risk to the transport network and the hinterland, maintaining the linear integrity of defences through to the Harbour. The Strategy confirms this intent. However, the Strategy also identifies the possible opportunity to modify the form of defence (breakwaters) taking advantage of the additional sediment supply from the Eastern Green Frontage (PU20.2). On this basis and the recommendation within the Strategy to adapt the defence approach it is proposed to change the intermediate policy to MR – Modify. This does not change the intent of the SMP to sustain protection to the area.					

Proposed policy (SMP Tracker)			
Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Maintain / Replace	Maintain protection to area
Intermediate	MR	Modify	Potential opportunity to modify protection to area.
Target	HTL	Maintain / Replace	Maintain protection to area

21.1(a)	Penzance Harbour & Docks	Current policy: (amended extent)	HTL	HTL	HTL
Discussion:		Change boundary between PU21.1 and 21.2 to the Lariggan Outfall, introducing a new policy unit (PU21.1(b) between Penzance Harbour Headland and Lariggan Outfall).			
The Strategy confirms the policy set by the SMP, with the intent to sustain operation of the Harbour and protection to the wider area behind.					

Proposed policy (SMP Tracker)			
Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Maintain / Replace	Maintain protection to area
Intermediate	HTL	Maintain / Replace	As above

Target	HTL	Maintain / Replace	As above

21.1(b)	Main section of Promenade (Jubilee Pool to Lariggan Outfall).	Current policy (PU21.1): Current policy (PU21.2)	HTL HTL	HTL MR	HTL MR

Discussion: Change boundary between PU21.1 and 21.2 to the Lariggan Outfall, introducing a new policy unit (PU21.1(b) between Penzance Harbour Headland and Lariggan Outfall).

The Strategy confirms the concern raised by the SMP with respect to PU21.2 over the increased risk of severe overtopping to the Promenade, with this concern extending over the full length of the Promenade. In line with the recommendations set out in the SMP, the Strategy confirms that use of breakwaters would provide a more adaptive approach, with stronger opportunity to develop upon the aspirations set out through the Neighbourhood Plan. The intent remains to provide protection to the area of the Main Promenade.

Recognising the intent within the Strategy to significantly modify the approach to management, the intermediate policy would be for MR – Modify, reverting to a policy of HTL once the new approach is in place.

Proposed policy (SMP Tracker)

Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Repair not Replace	Maintain protection to area
Intermediate	MR	Modify	Maintain protection to area with a modified approach
Target	HTL	Maintain / Replace	As above

21.2	Wherrytown (Lariggan Outfall to Tolcarne).	Current policy:	HTL	MR	MR

Discussion: Change boundary between PU21.1 and 21.2 to the Lariggan Outfall.

The Strategy confirms the need to consider MR over this frontage, providing a more sustainable form of defence, maintaining a set back defence to the main road and property. The approach aims to deliver a more sustainable transition between the shoreline and the open space of the Foster Bolitho Gardens. Associated with this approach is potential opportunity to increase tidal influence within the Lariggan Valley.

Proposed policy (SMP Tracker)

Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Repair not Replace	Maintain protection to area
Intermediate	MR	Slow Erosion	Allow a sustainable approach to defence of the road and property
Target	MR	Natural Features	As above but also considering opportunity to increase tidal influence within the Lariggan Valley.

21.3	Newlyn	Current policy:	HTL	HTL	HTL

Discussion: No change

The strategy confirms the intent to sustain defence to Newlyn, Newlyn Harbour and Tolcarne

Proposed policy (SMP Tracker)

Stage	Policy	Sub-category	Policy Rationale / Intent of Management
Present	HTL	Maintain / Replace	Maintain protection to area
Intermediate	HTL	Maintain / Replace	As above
Target	HTL	Maintain / Replace	As above

21.4	Sandy Cove	Current policy:	NAI	NAI	NAI

Discussion: No change

The SMP identified the potential need for local management as part of regeneration strategy for Newlyn. The Strategy confirms that at present the Sandy Cove beach remains relatively stable, being strongly dependent on sustaining on the South Pier (PU21.3).

Proposed policy (SMP Tracker)

Stage	Policy	Sub-category	Policy Rationale / Intent of Management

Present	NAI	Local Activity Only	Little justification for defence (subject to regeneration of Newlyn Harbour)
Intermediate	NAI	Local Activity Only	As above
Target	NAI	Local Activity Only	As above

22.1	Cliff Road	Current policy:	HTL	HTL	HTL
Discussion:		No change			
The Strategy confirms the important coastal route to Mousehole. The intent is to sustain existing defences but not to extend defence to unprotected areas, maintaining exposure of the natural cliffs.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Maintain / Replace	Sustains transport route		
Intermediate	HTL	Maintain / Replace	As above		
Target	HTL	Maintain / Replace	As above		

22.2	Mousehole	Current policy:	HTL	HTL	HTL
Discussion:		No change			
The Strategy confirms the importance of the main Harbour structures as part of sustaining protection to the village. Locally, within the Harbour there maybe the need for local level resilience measures to address current and future flood risk.					
Proposed policy (SMP Tracker)					
Stage	Policy	Sub-category	Policy Rationale / Intent of Management		
Present	HTL	Maintain / Replace	Protection to Mousehole trough sustaining Harbour structures.		
Intermediate	HTL	Maintain / Replace	As above		
Target	HTL	Maintain / Replace	As above		

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