West Wight Coastal Flood and Erosion Risk Management Strategy

MAIN STRATEGY DOCUMENT
FINAL
2016

Environment Agency

Funded by UK Government

CAPITA | AECOM

ISLE of WIGHT COUNCIL

CAPITA | AECOM

This Strategy was produced for Isle of Wight Council with technical assistance from the engineering and environmental consultant CAPITA | AECOM.

This project was funded by the Environment Agency from Flood and Coastal Risk Management Grant-in-Aid.

Contents

Glossary and Acronyms

Baseline
Defines an existing condition/situation (usually Do Nothing) against which options or scenarios are compared.

Benefits
The savings (damages avoided) delivered by implementing strategy options.

Broader Outcomes
Rather than solely considering flood and coastal risks, the Strategy has taken account of other benefits to the community such as regeneration, tourism, recreation, amenity and coastal access opportunities.

Costs
The amount of money required to implement the strategy options.

Do Minimum
A management option defined as the minimum amount of action or intervention necessary to deliver the legal requirement or sustain the standard of service of the asset.

Do Nothing (No Active Intervention)
A management option defined as taking no action whatsoever; where there are existing defences, do nothing assumes that no further maintenance or repair work is undertaken.

Grant in Aid
Money coming from the central government to fund a coast protection of flood protection scheme.

HTL (Hold the Line)
A policy with an overarching intent to build or maintain coastal defences so that the position of the shoreline remains where it currently is.

Maintain
A management option in which maintenance of the existing defences is undertaken. This option does not change the defence or its performance, but simply maintains it in good working order or restores it to its previous condition in the event of a breakdown.

MR (Managed Realignment)
An environmental management approach that involves altering the location of the line of defence, working to provide a more sustainable position from which to manage flood and erosion risks. It can involve advancement (moving forward), set back, or breach of the existing defence line. Most commonly, it involves establishing a new set back line of defence on the coast or within an estuary.

ODU (Option Development Unit)
A section of the coastline in which local scale options to manage flood and erosion risk are developed.

Partnership Funding
This describes the way coastal defences are often paid for where various "partners" have input into the project. Typically this refers to joint funding between government and private sources.

Potentially contaminated land
Land potentially containing substances in or under the land which could pollute controlled waters or cause significant harm to other receptors such as humans, animals or the environment.

Present Value
An economics term which refers to the current worth of a future sum of money.

Priority Schemes
The initial works required following the Strategy to address flood and erosion risk in key areas.

Property Level Protection (PLP)
Flood mitigation measures applied to individual properties that reduce the risk of flooding on a property level (i.e. door flood defenders etc).

Residual life
The time left (typically in years) that a defence structure is expected to be able to provide flood and erosion protection before it comes to the end of its service life. The residual life is estimated from a defence condition survey and assumes that no maintenance works will be carried out in the future.

Scheme
A measure, or combination of measures, undertaken to increase the level of protection against flooding and/or erosion to a local area (e.g. a new floodwall structure).

SMP (Shoreline Management Plan)
A high-level non-statutory planning document which provides a broad scale assessment of the risk associated with coastal processes and presents the long-term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner. The Isle of Wight SMP2 was published in 2010 and approved in 2011.

SMZ (Strategy Management Zone)
A group of units (ODUs) with similar characteristics in which overarching, wider scale options to manage the flood and erosion risk are developed.

Standard of Protection (SoP)
The level of flood risk that a coastal defence structure is designed to protect against. For example, a defence structure with a 1:100 year SoP indicates that the structure will protect against flooding from a flood event which typically occurs once every 100 years.

Sustain (e.g. the standard of protection)
This is a flood risk management term which refers to options that keep pace with change and potential increases in risk in the future (i.e. from climate change and sea level rise). This is achieved by raising or upgrading defences in the future to sustain the standard of protection.

Abbreviations

STRATEGY LANDOWNERS

HA	Highways Authority
PO	Private Ownership

ENVIRONMENTAL DESIGNATIONS

SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
SAC	Special Areas of Conservation
SM	Scheduled Monuments
NNR	National Nature Reserve
LNR	Local Nature Reserve

ENVIRONMENTAL ASSESSMENTS

WFD	Water Framework Directive
QRA	Qualitative Risk Assessment
HRA	Habitats Regulations Assessment
SEA	Strategic Environmental Assessment

OTHER

CAPITA/AECOM	Environmental and Engineering Consultants

View towards Cowes from across the Medina

intro

Introduction

Setting the scene

intro

Introduction

The Isle of Wight Council (IWC) and the Environment Agency with Capita | AECOM engineering consultants have developed a Coastal Flood and Erosion Risk Management Strategy.

The West Wight Coastal Flood and Erosion Risk Management Strategy recommends the preferred strategic approaches for managing coastal flood and erosion risk for an 84km frontage of the Isle of Wight coast running from Freshwater Bay clockwise round to Old Castle Point, East Cowes (see figure overleaf).

The Strategy frontage features a wide variety of natural, rural and urban landscapes. The frontage includes sheltered estuarine environments of the Western Yar, Newtown estuary and the Medina, the bays of Freshwater, Totland, Colwell, Thorness and Gurnard, the headlands around Cowes, and then the more rugged exposed open coast around the Needles.

Three of the Island's largest urban areas are within the Strategy frontage; Cowes, East Cowes and Newport (key employment centres). Totland, Yarmouth and Freshwater are the main settlements in the west of the Island, also all located on the coast.

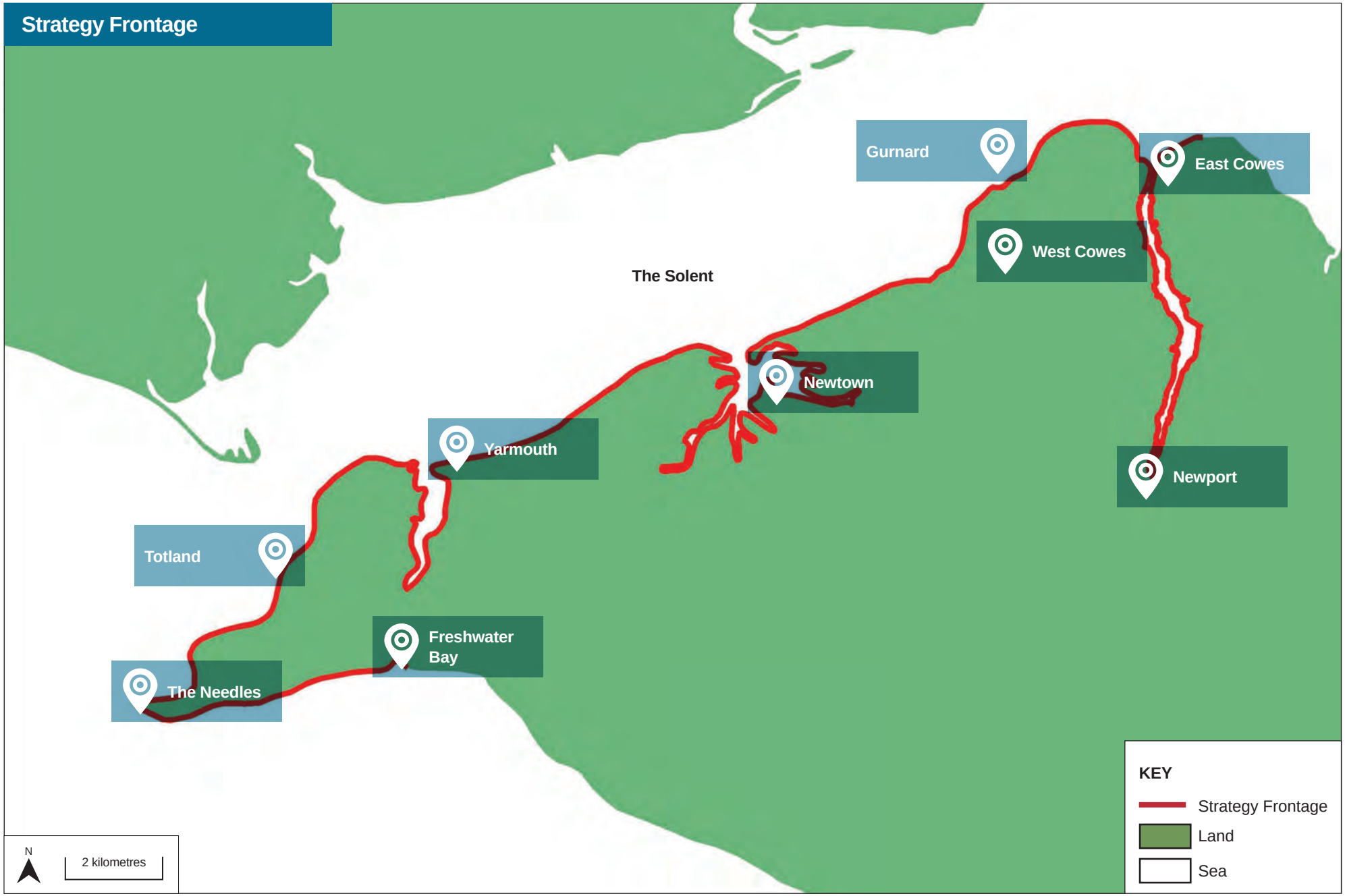
The Strategy frontage is home to a rich variety of important habitats and species and has a wealth of internationally, nationally and locally important nature conservation sites along the majority of its coast and coastal waters. These include European Natura 2000 sites that are protected by international legislation as well as national designations.

Many of the current settlements on the Island are historic, with 32 Conservation Areas, almost 2,000 listed buildings, 122 Scheduled Monuments and 9 Registered Parks & Gardens.

In a planning context the Isle of Wight is unique, being an island with a large proportion of environmental designations, a coastal and maritime economy, and a fundamental reliance on ferry ports and coastal roads as its key strategic transport links. Large parts of the area are designated as an Area of Outstanding Natural Beauty (AONB) and much of the coastline is defined as Heritage Coast

With such a diverse coastline and range of facilities, tourism is a key industry for the Isle of Wight. Residents and visitors are well served by a number of ferry routes with East Cowes and Yarmouth hosting two of the three vehicle ferry links to the Isle of Wight, plus a key passenger ferry terminal in West Cowes.

There is a wide range of existing coastal defences around the West Wight frontage which help prevent erosion and reduce flood risk. However many of these aging defences were built in times of greater economic prosperity and the future maintenance or replacement of these structures provides a significant problem in these more challenging economic times. National 'Grant in Aid' funding is available to help fund defence works in the areas most at risk nationally. However the outcomes on which this public 'Grant in Aid' funding is calculated and administered are heavily focussed around protection of residential communities, rather than businesses, or to provide tourism or recreational benefits.


Strategy Frontage
Gurnard
East Cowes
West Cowes
The Solent
Newtown
Yarmouth
Newport
Totland
Freshwater Bay
The Needles
KEY
Strategy Frontage
Land
Sea
N
2 kilometres

WITH THE MAJORITY OF COMMUNITIES AND FEATURES OF INTEREST SITUATED AROUND THE COASTLINE, COASTAL FLOOD AND EROSION PRESENTS A SIGNIFICANT RISK. WITHOUT ACTIVELY IMPLEMENTING MEASURES TO MANAGE THESE RISKS IN ROBUST AND STRATEGIC WAYS, THERE WILL BE OVER 4,000 PEOPLE AND 1,500 PROPERTIES AT INCREASED RISK BY 2115.

There is therefore a realisation that future public investment in defences will have to be rationalised and prioritised in key areas. However, as recognised in the development of the Strategy, there are significant opportunities to help pay for new defences through a partnership approach, a new approach to funding required by national government. For example, working with developers and the potential beneficiaries of future schemes to fund future defences, and contribute to broader outcomes for communities at risk. This kind of approach will be key to the delivery of the Strategy.

For further information about the Isle of Wight please visit www.iwight.com

Strategy Objectives

The aim of the West Wight Coastal Flood and Erosion Risk Management Strategy is to reduce risks to people, the developed and natural environment from flooding and coastal erosion through the development and implementation of a sustainable Strategy that encourages provision of technically, economically and environmentally sound management measures.

The objectives were enshrined in the Strategy development process and were key considerations in the appraisal of potential management options. Given the wide range of objectives, and the competing interests of the coast, it is not possible for the Strategy to meet and deliver all of these aims. However, it was important that the Strategy seeks to facilitate as many of these as possible. The primary (must have) objectives are listed below:

Primary objectives

- To build on the work of the Isle of Wight Shoreline Management Plan 2, 2011;
- To identify the consequences of implementing the preferred Policies from the IW SMP2, and to seek and select the most appropriate and achievable methods to do so;
- To determine the optimum economic level of coastal flood and erosion protection for the West Wight through assessment of options;
- To provide a co-ordinated approach between the authorities and organisations managing the coastline;
- To refine the understanding of coastal flooding and erosion risks to people and the developed, historic and natural environments using the latest information;
- To balance the needs of people and the environment, in a dynamic coastal environment with flood, erosion and landslide risks;
- To identify any required Schemes, including their location, timing, feasibility, costs, benefits and associated Partnership Funding scores and Outcome Measures;
- To consult with the community to seek acceptable and achievable methods to implement the IW SMP2 Policies;
- To identify the operating authority or landowners responsible for new and existing infrastructure and begin work with them to develop proposals;
- To identify the requirements and opportunities for financial contributions for any proposed schemes, in line with Partnership Funding requirements;
- To comply with environmental legislation and identify opportunities

for environmental enhancement, allowing where possible the natural process and evolution of the shoreline;
- To consider opportunities for broader outcomes linked to initiatives such as regeneration, development, tourism, recreation and amenity; and
- To define and prioritise an implementation plan of technically, economically and environmentally sound and sustainable proposals for managing coastal flood and erosion risks over the 100 year appraisal period.

The Shoreline Management Planning Hierarchy

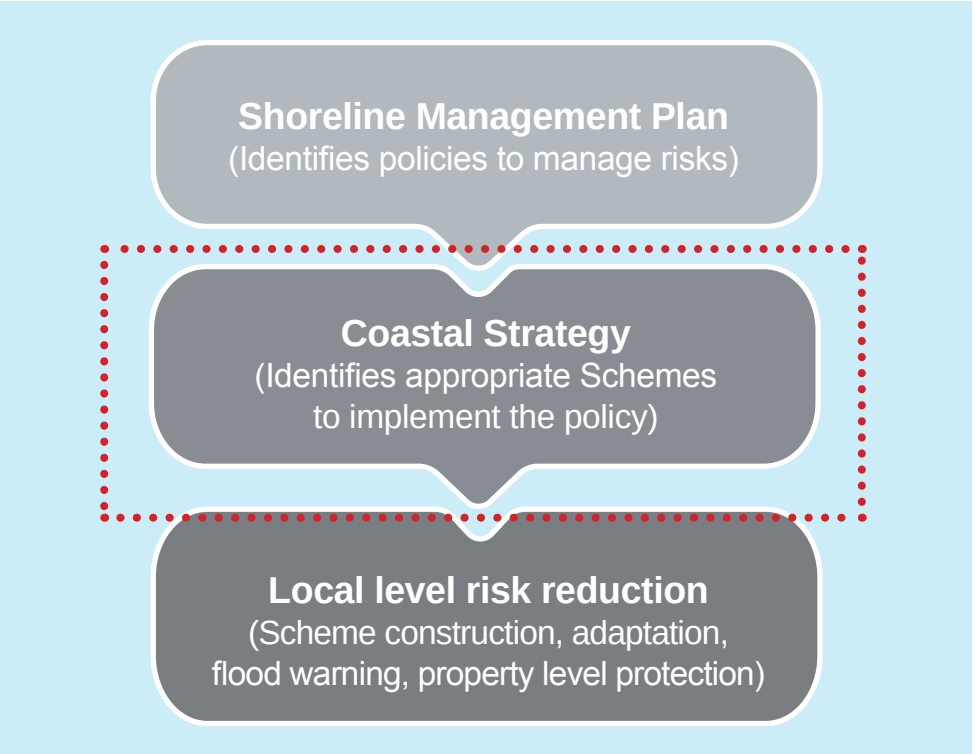
The following section outlines how the Strategy fits into the coastal management hierarchy in the UK and outlines the approach to developing the draft strategic management options, which underwent a three-month period of consultation prior to being finalised.

The Shoreline Management Plan – sets the policy

Shoreline Management Plans (SMPs) sit at the top of the hierarchy of plans for managing coastal flooding and erosion. A Shoreline Management Plan (SMP) is a high-level non-statutory planning document which provides a large-scale assessment of the risks associated with coastal processes and presents a long-term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner. An SMP aims to manage risk by employing a range of methods which reflect both national and local priorities, to:

- Reduce the threat of coastal flooding and erosion to people and their property; and
- Benefit the environment, society and the economy as far as possible, in line with the Government's 'sustainable development principles'.

The Isle of Wight Shoreline Management Plan (2011) presents the shoreline management policies for the Strategy study area. Given the urban areas, and the potential threat of erosion and coastal flooding, the policy for a significant part of the frontage is to 'Hold the Line' for the coming century. This policy does not necessarily mean defences will be built or maintained in these areas, as funding (especially public funding) is often a limitation, however if there is available funding this policy is recommended to robustly manage the future risks. This policy can also mean it is appropriate to continue to defend the shoreline with private defences. In order to maintain key habitats and natural environment there are also significant areas of the frontage where the policy is to allow natural process to continue ('No Active Intervention', or do nothing). In local appropriate areas a 'Managed Realignment' Policy has been recommended in order to help balance habitat losses created by continuing to defend the coastline elsewhere.



The Coastal Management Hierarchy

The need for a strategic approach

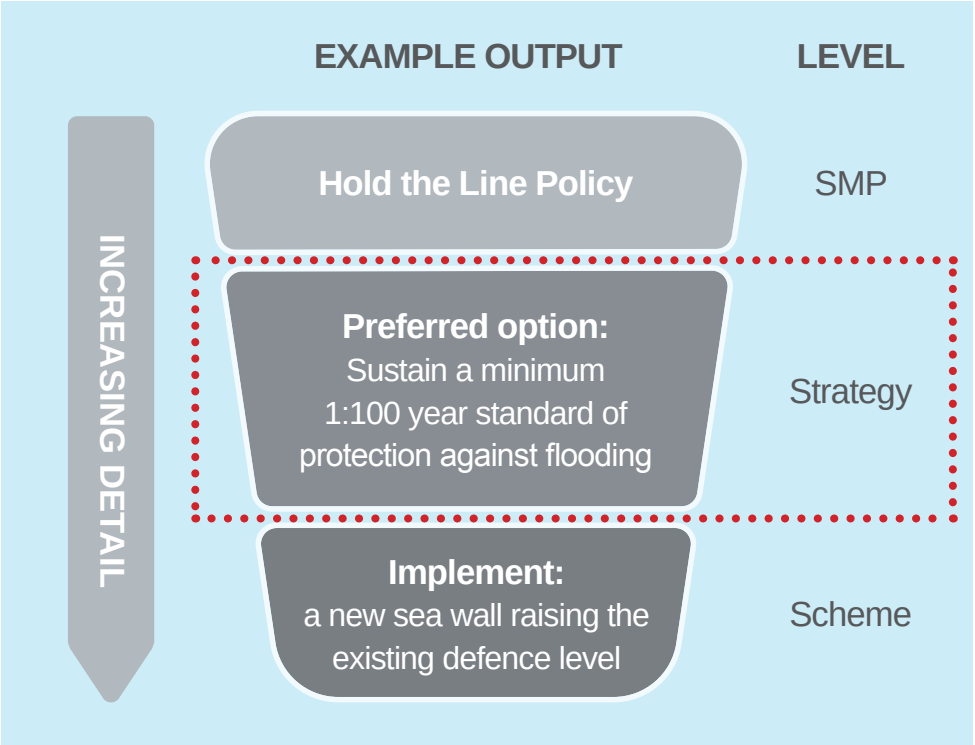
Coastal strategies sit at the next tier in the hierarchy and it is the role of strategies to identify the appropriate scheme or flood risk mitigation option for implementing the SMP policies. The Strategy will review the SMP policies in more detail to ensure these high level policies remain appropriate at the local scale.

The Strategy considers how flood and erosion risk is likely to change in the future in response to changes in climate and develops sustainable and robust options to manage the risks associated with coastal flooding and erosion. This approach ensures that technically feasible, environmentally acceptable and economically viable options are recommended, to reduce the risks from coastal flooding and erosion to people, their properties and the environment. This also ensures that the options are compatible with the preferred management strategies of adjacent areas. The Strategy is also required in order to gain approval for future schemes, and helps secure public Grant in Aid monies to contribute to the cost of defences.

Without such an approach, it is likely that future coast defence works would be managed on an 'ad-hoc' or reactive basis which would lead to poor cost efficiency and a general increase in the flood and erosion risk over time. A strategy is also important in providing an integrated approach to the management of our coastline and prioritising risks and responses. The holistic wider-level thinking behind strategy decisions ensures that the management options implemented in one area do not increase the flood and erosion risk in adjacent areas, and that opportunities to deliver wider benefits are not missed.

The outputs

Following a strategy, a variety of outputs can result depending on the level of risk and the preferred options put forward. To deliver the strategic management option it may be necessary to implement works

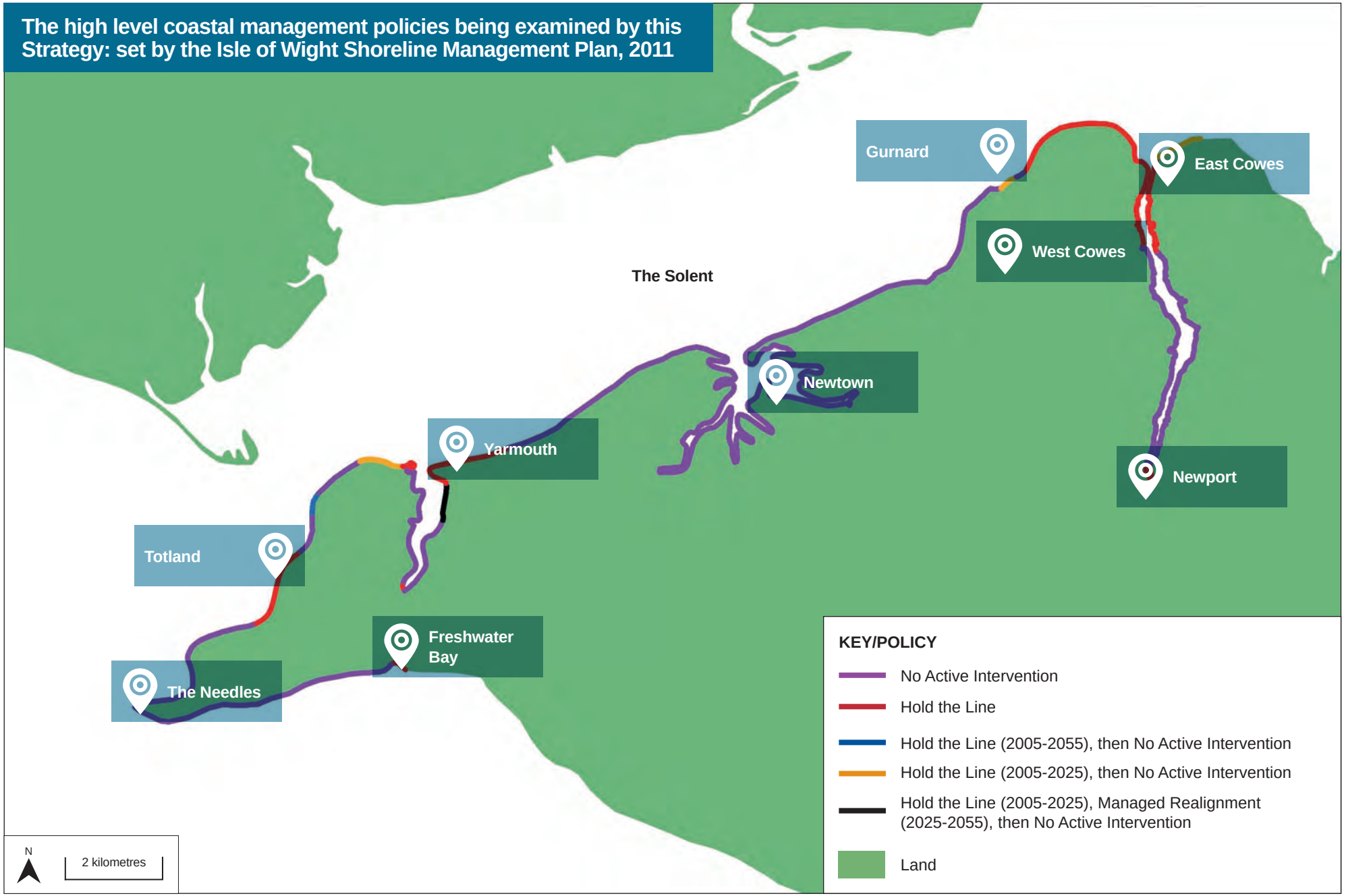


How the Strategy fits in the management of coastal flood and erosion risk

to address coastal flood and erosion risks. In other areas, where little is at risk, the future action may be to 'do nothing' and let natural processes continue. There may also be actions such as monitoring, setting planning policy and further detailed studies required in order to gather additional evidence to make robust future decisions.

Where schemes are required, a further element of work comparing the various options in more detail is then undertaken to select the preferred measures, methods and optimal standard of protection. The detailed business case will be developed to gain funding and approval. On approval of the scheme, detailed design is carried out and then the works can be implemented the ground. Schemes do not only deliver raised defences such as new sea walls; other options

The high level coastal management policies being examined by this Strategy: set by the Isle of Wight Shoreline Management Plan, 2011



include flood warning systems, property level protection, adaptation options and environmental enhancement.

Purpose and structure of this document

This document presents the Final Strategy and sets out the preferred options and recommendations for managing coastal flood and erosion risk for the study frontage for the next 100 years. In developing the Strategy, an understanding of the present day risk has been developed along with how it might change in the future and the ways in which we can manage and adapt to these changes. Specifically, this document includes:

Chapter 2 – Understanding what is at risk

- **A summary of what is at risk now and in the future (defining the baseline).** Including an assessment of what would happen if we 'do nothing' and how the risks change over time as a result of predicted climate change and sea level rise. This sets the context for why we need the Strategy.

Chapter 3 – Developing the Strategy

- **Overview of the study area - Key Features, Issues and Opportunities.** This identifies the key aspects and characteristics of the study area which the Strategy has considered. This includes: coastal processes, potentially contaminated land, the environment, stakeholder engagement and aspirations, and a summary of the existing defences.
- **A description of the option development and appraisal process.** Including a summary of how the strategic options were developed and appraised considering their economic and environmental sustainability.

Chapter 4 – Strategy overview

- **A summary of the Strategy** – including the phasing of options over time based on the level of risk.
- **Links with planning and redevelopment** – including how the Strategy has been developed to take account of these key issues.
- **Environmental Impacts Summary** – including how the Strategy has been developed to ensure that it is environmentally robust and sustainable..

Chapters 5 to 10 – Management Zones 1 – 6

- **The preferred options by Management Zone.** An area by area summary of the Strategy options to reduce future coastal flood and erosion risk. Urgent priority works are also identified within this section.

Chapter 11 - Funding

- **An overview of funding sources for coastal schemes.**
- **A summary of the priority schemes arising from the Strategy.**

Chapter 12 – What next?

- **A summary of what happens next and how you can find out more.**

Supporting Information
This document provides a concise summary of the Strategy findings and proposals. For more detailed information please refer to the following Appendices.

These are available online at www.coastalwight.gov.uk

Appendix A
Defence Condition Review

Appendix B
Contaminated Land Review

Appendix C
Coastal Processes Review

Appendix D
Flood Modelling and Risk Mapping

Appendix E
Stakeholder Engagement Feedback

Appendix F
Economic Appraisal

Appendix G
Strategic Environmental Assessment Report

Appendix H
Habitats Regulations Assessment Report

Appendix I
Water Framework Directive Assessment

Appendix J
Option Development and Appraisal

The two Risk Management Agencies in the Strategy area are the Isle of Wight Council and the Environment Agency. For further information please visit their websites below:

- **www.iwight.com**
- **www.gov.uk/government/organisations/environment-agency**

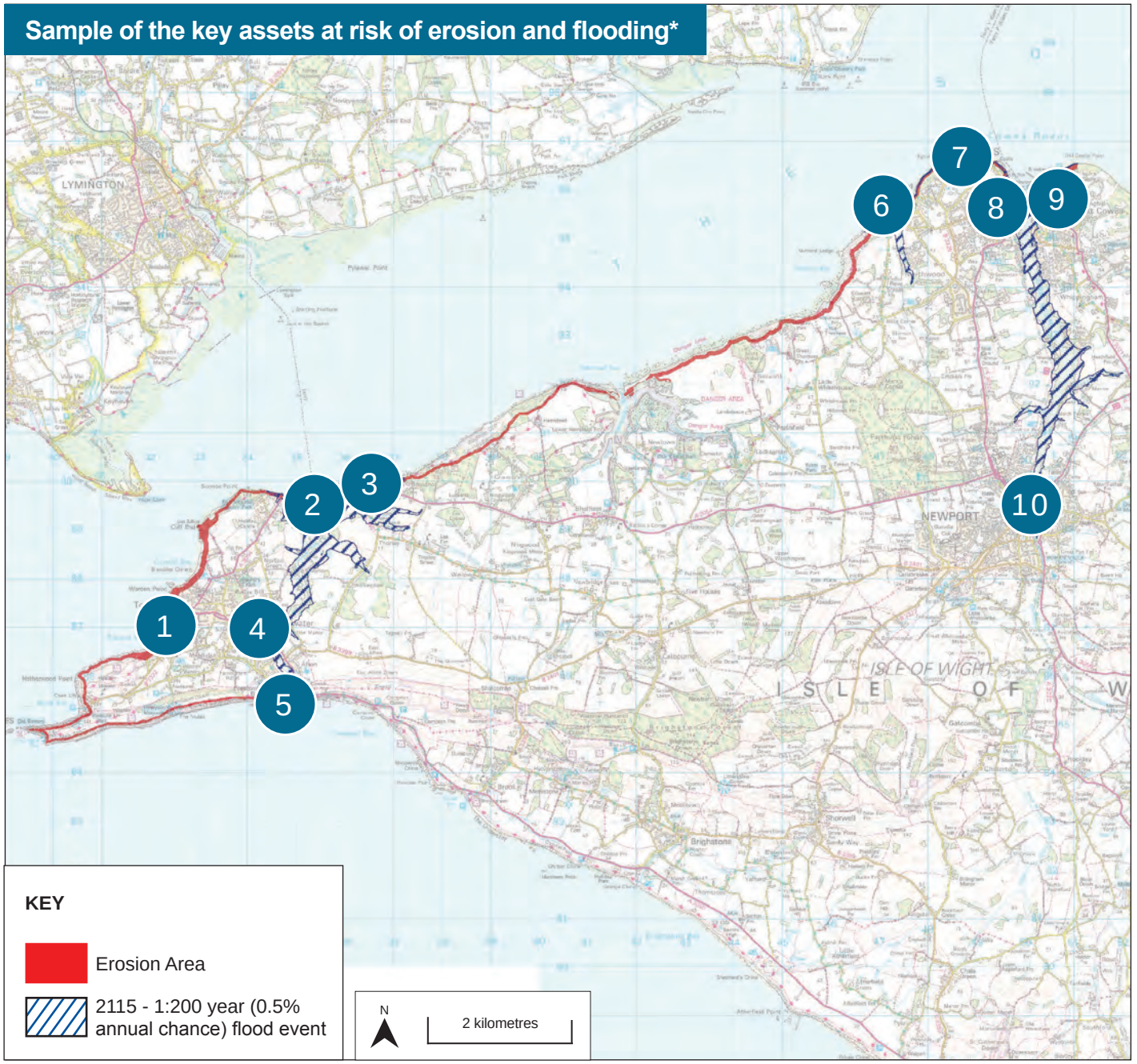
Newport Quay Flooding

risks

What is at risk if we do nothing?

Why do we need the Strategy?

Sample of the key assets at risk of erosion and flooding*



1. **Totland**
   at risk of erosion

2. **Yarmouth**
   at risk of flooding and erosion

3. **Bouldnor Road**
   at risk of erosion

4. **Freshwater**
   at risk of flooding

5. **Freshwater Bay**
   at risk of flooding and erosion

6. **Gurnard Luck**
   at risk of flooding and erosion

7. **Gurnard - Cowes**
   at risk of erosion, landslide reactivation and flooding

8. **Cowes**
   at risk of flooding and erosion

9. **East Cowes**
   at risk of flooding and erosion

10. **Newport**
    at risk of flooding

*Flooding extent from an event with a 0.5% chance of occurring at 2115 assuming current defences are in place

Summary of people and assets potentially at risk of coastal flooding and erosion over the coming century
Over 1,100 residential properties
Over 300 commercial properties (shops, offices etc.)
Over 100 warehouses
38 industrial sites
46 public buildings
31 restaurants/pubs/cafes
2 supermarkets
142 leisure facilities
13 car parks
28 electricity sub-stations
1 school
3 ferry terminals linking the island to the mainland
Multiple marinas
Numerous coastal footpaths
Major roads including the A3054 and A3055
Heritage assets (including 6 Scheduled Monuments and over 100 Listed Buildings
Environmentally designated habitats
Coastal waterbodies
Local and national nature reserves
Country parks
Tens of kilometres of coastal promenades, slipways
N22 cyclepath between Freshwater and Yarmouth
Beaches used by residents and as visitor attractions

Why we need the Strategy - what is at risk if we 'Do Nothing'?

Gaining an understanding of the flood and erosion risk along the shoreline is imperative in order to define a baseline for developing the coastal strategy. It allows comparisons to be made between the potential management options. The baseline was established by considering a 'Do Nothing' scenario.

The 'Do Nothing' scenario is defined as: *"Where there is no further intervention of any kind, including no emergency response or warning system, and nature is allowed to take its course. Where there are assets present or where maintenance activities or other interventions are carried out, the option will be to withdraw all activities".*

In essence, the 'Do Nothing' scenario represents a hypothetical situation whereby all existing defences are abandoned in terms or maintenance or repair, and no remedial or additional protection works are carried out. In addition, adaptation to sea level rise or other climate change responses are not addressed.

	Time Horizons			
	2015	2025	2055	2115
Residential properties (flood risk)	202	225	244	359
Commercial properties (flood risk)	276	306	316	336
Total properties at risk of flooding	478	531	560	695
Total properties at risk of erosion (Residential and Commercial)	0	6	347	1404
Total Value of Assets at Risk (£M cash)	**£97M**	**£115M**	**£227M**	**£472M**

Properties at risk of flooding and erosion over the coming century if we 'Do Nothing'.
Based on 1:200 year (0.5% annual chance) flood event.

What is meant by flood risk?
The likelihood that a certain level of flooding will occur is described as 'flood risk' or the 'chance' that a location will flood in any once year. This risk can be expressed in terms of an average return period in years. For example a large event occurring on average once per century may be referred to as a 1 in 100 year event (there is a 1% chance of a flood of this scale in any one year). An extreme event which typically only occurs once in any 200 year period is termed a 1 in 200 year event (this means there is a 0.5% annual chance of an event of this scale occurring), and so on.

The chance is related to the scale of the flooding. In any one year a large (1 in 200 year) flood event has statistically less chance of happening than a smaller 1 in 100 or 1 in 50 flood event. It is important to understand that a 1 in 100 chance of flooding does not mean that a flood will only happen once every 100 years. The chance remains the same every year. Throughout this document the scale of flood risk is described in terms of the average return period in years.

When protecting against flooding, the risk level that a scheme protects against is described as the Standard of Protection (SoP). For example, if a scheme provides a 1:100 year SoP it means there is a high degree of certainty that it will prevent flooding from all events up to this magnitude.

What is meant by erosion risk?
For the purposes of the Strategy, properties or assets at risk of erosion are those which could potentially be lost to the sea through shoreline retreat or landslide. The baseline risk has been estimated assuming no further works are done to repair or maintain defences which currently provide protection.

Understanding the potential erosion risk under a hypothetical 'Do Nothing' scenario' is important for comparing the relative merits of options to maintain or improve protection.

For the purpose of the Strategy, the risks posed by coastal flooding and erosion over the next 100 years have been established using Environment Agency approved numerical flood modelling and updated Shoreline Management Plan erosion predictions (to account for Environment Agency guidance change on sea level rise allowances). It should be noted that even with the existing defences in place; future flood risk will increase significantly due to climate change and rising sea levels.

Through determining the present and future flood and erosion risks under a 'Do Nothing' scenario, the properties, features, assets and key infrastructure that are in need of protection over the next 100 years have be identified and valued. The preferred options to manage the risks strategically have then been developed.

Sea level rise and increasing risk

As a consequence of climate change and continued warming of the global oceans, sea levels are expected to increase in the future. This will increase flood and erosion risk across the Strategy frontage over the next 100 years.

To consider sea level rise, the Strategy has incorporated the latest sea level rise projections (UK Climate Projections 2009) into the flood modelling to produce 'Do Nothing' flood scenarios for 2025, 2055 and 2115. Following the latest guidelines, under the 'medium emissions' sea level rise scenario, mean sea levels across the strategy frontage are expected to increase by approximately 0.75m over the coming century.

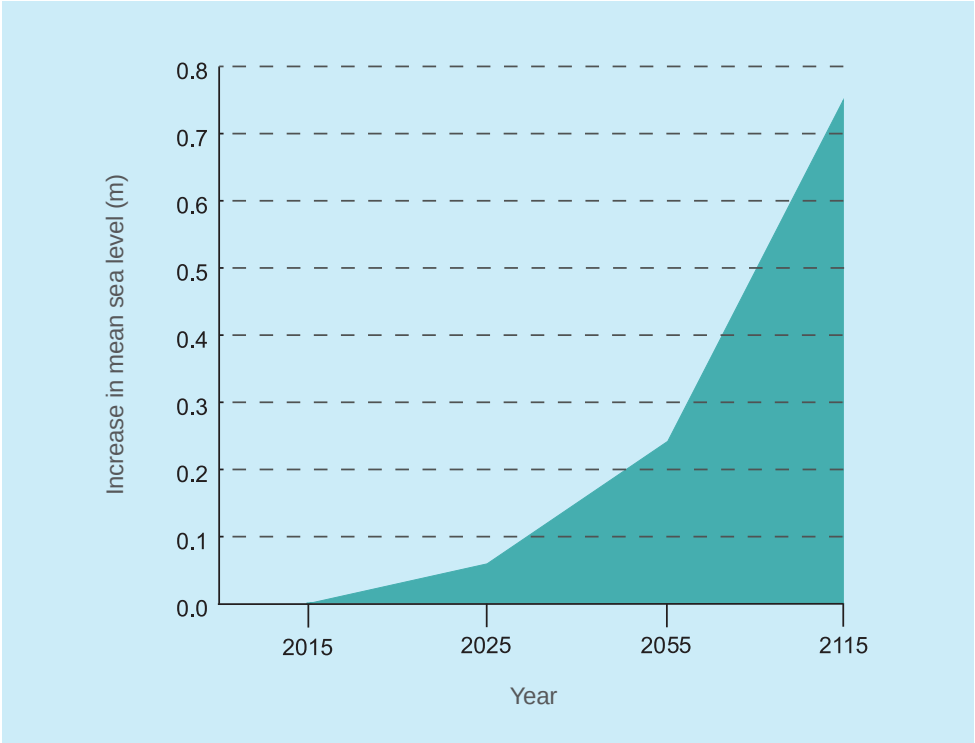
The figure (opposite) shows the cumulative relative sea level rise projections (m) at Cowes over the next 100 years that have been adopted by the strategy.

Coastal flood and erosion risk would increase significantly in the future across the Strategy frontage under a ‘Do Nothing’ scenario due to sea level rise.

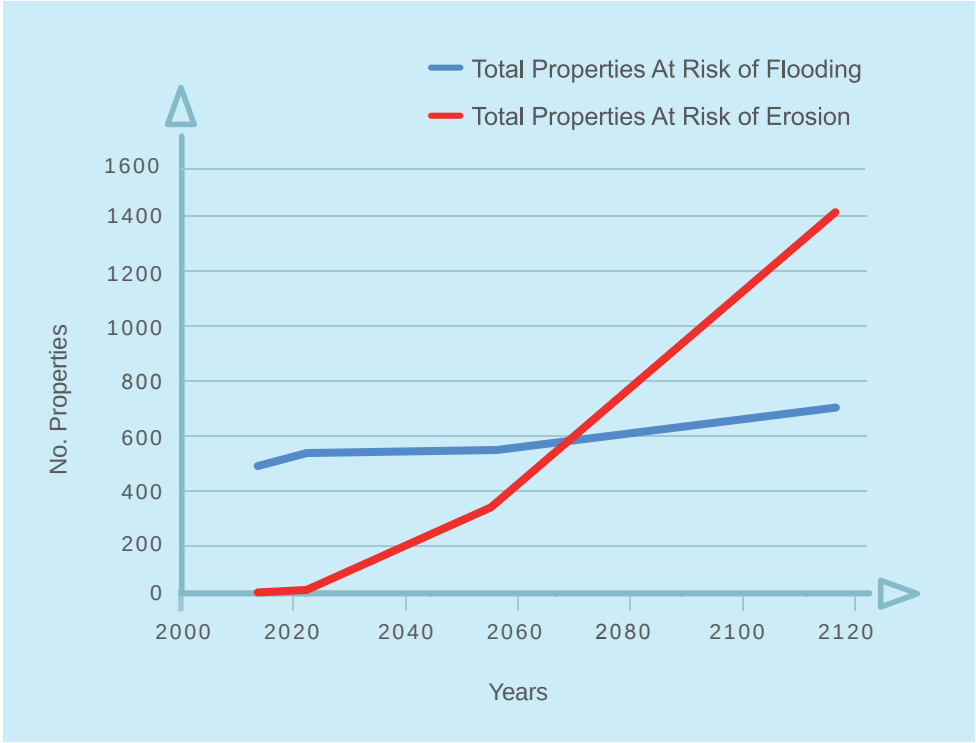
As well as residential and commercial properties, there are many other important features and valuable assets at risk. This includes industrial sites, public buildings, leisure facilities, a school, ferry terminals, marinas, coastal footpaths, environmentally designated sites, a cyclepath and beaches.

For more detailed information on the extreme water levels used in the Strategy please refer to Appendix C: Coastal Processes Review

For more detailed flood mapping see Appendix D: Flood Modelling and Risk Mapping



Increase in sea levels expected (compared to present) as a result of climate change



Increasing number of properties at risk of flooding and erosion over time

Road between Yarmouth and Shalfleet

approach

How the Strategy has been developed

Approach to option development

Overview of the study area and the Strategy development process

Before strategic approaches to managing flood and erosion threats can be identified and evaluated, it is important to understand the key features, issues and opportunities that exist within the Strategy area. In order to achieve this, a number of studies and activities were undertaken during the early part of the Strategy development.

These included:

- **Site walkovers and visual inspections** – to determine the location, type and condition of existing coastal defences and assets (See Appendix A for detailed findings);
- **Desktop assessment of potentially contaminated land** – to identify potentially contaminated land uses along the frontage which may require defences to prevent them polluting the environment (see Appendix B for more details);
- **A desktop review of coastal processes** – required to understand waves, tides, sediment movements and their interaction around the study area (see Appendix C);
- **Review and operation of Environment Agency approved numerical hydraulic models** to update previous flood risk projections and estimate damages from a Do Nothing scenario (see Appendix D for further details).
- **Identification of important environmental and heritage features around the coast** – so that key environmental objectives and legal requirements to protect the environment can be accounted for in the Strategy (see Appendices G, H and I for details).
- **Engagement with key stakeholders** – meaningful engagement with numerous community groups, organisations and individuals to identify key issues, opportunities and potential for funding contributions, and broader outcomes along the shoreline which can help to shape future coastal management (see Appendix E for more details).

A summary of the findings of these activities required to understand the baseline for the Strategy is provided in the sections below.

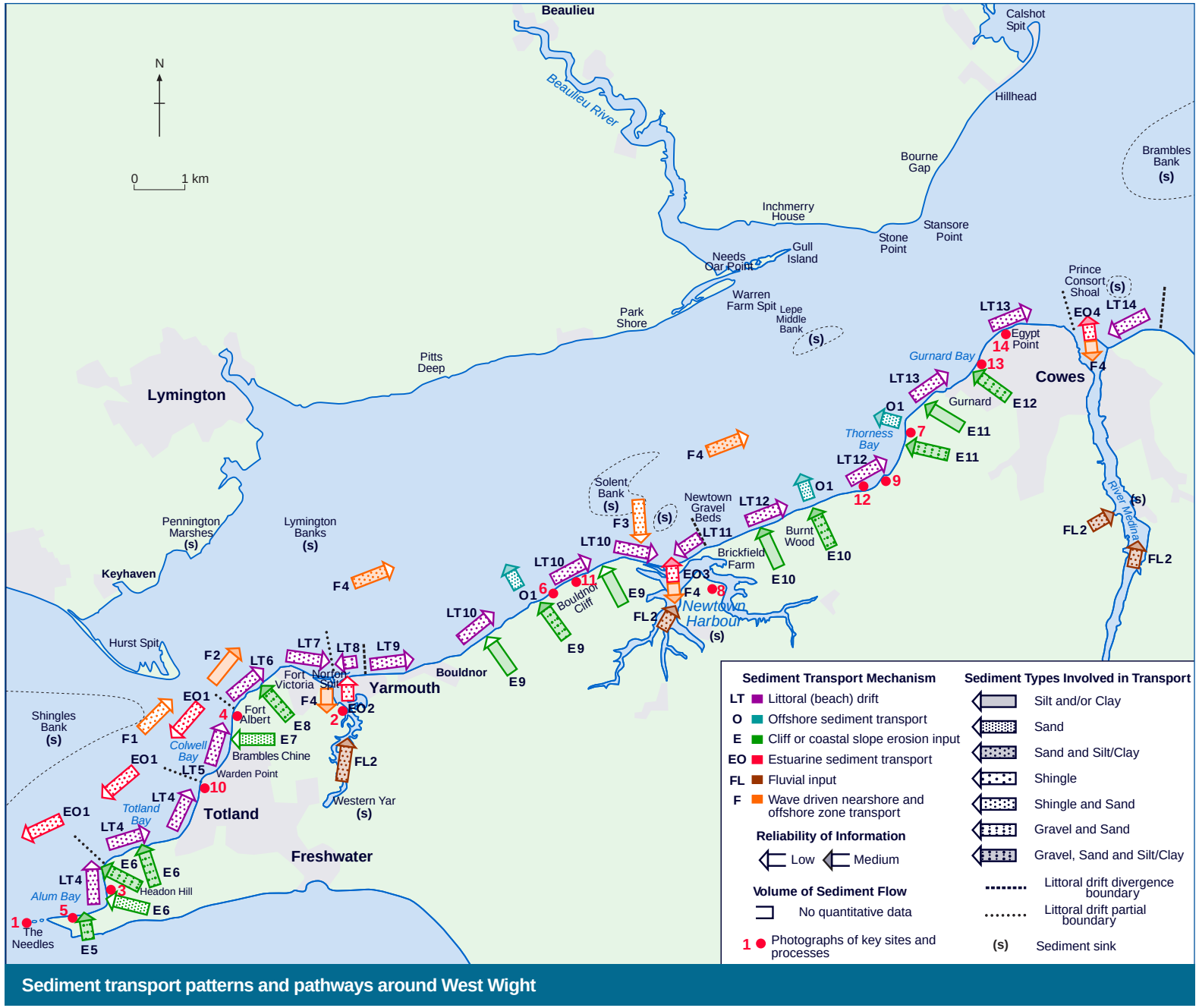
Coastal processes overview – wave, tides, sediment transport

The Strategy frontage is highly diverse and varies in not only in character but also with regard to the forcing conditions it experiences, driven by the weather and tides, including prevailing south-westerly winds. Wave heights vary considerably with large storm waves (5m+) affecting the exposed open coast environments around Freshwater Bay and the Needles with only small wind driven waves (typically <1m) affecting the shallow estuaries and embayments on the north coast of the West Wight area.

The tidal regime along the Strategy frontage also varies considerably with a much smaller tidal range at Freshwater than at Cowes. The tidal curve is asymmetrical with a longer more gradual flood tide, and faster, shorter ebb tide. There is also an extended period (2-4 hours) of high water levels around high tide. This feature is particularly important when considering flood risk as it can increase the duration of flood events if storm conditions coincide.

Much of the western part of the frontage comprises undefended cliffs and the continued erosion of these helps provide sediment to nourish the beaches in the surrounding areas. The pathways of sediment movement have been well established in previous studies, such as the Shoreline Management Plan. The dominant movement of sediment for almost the entire frontage is from west to east.

For more information see Appendix C: Coastal Processes Review



Sediment transport patterns and pathways around West Wight

Source: SCOPAC Sediment transport study - http://www.scopac.org.uk/sediment-transport.html

Potentially Contaminated Land

When considering options to manage future flood and erosion risk it is necessary to consider potential risks to areas of potentially contaminated land. Contaminated land is defined as any land which appears to the Local Authority to be in such a condition, by reason of the substances in, on or under the land, that:

a) Significant harm is being caused or there is a significant possibility of such harm being caused; or b) Pollution of controlled waters is being, or is likely to be caused.

For land to be formally designated as being 'contaminated' it must be clearly demonstrated that there is:

- a contaminative source present (above a threshold level)
- a receptor which can be affected by the source; and
- a pathway linking a source to a receptor

Contaminated land often arises from present or historic land uses such as landfilling, industrial processes, military operations, as well as accidents or spills of contaminants, waste disposal or leaking underground storage tanks. In the coastal zone the presence of contaminated land is a risk because erosion of the shoreline, or flooding, can release the contaminants into the environment through exposure and leaching. If not dealt with adequately, contaminated material can pose a threat to human health, the environment and sustainable economic development.

In order to determine the risk of contaminated material being released into the environment, the likelihood of contaminated land being present along the frontage was first established. To do this the desktop study used former land use data to identify whether land is likely to be contaminated or not. If an area was thought to have potentially contaminating substances, the area was designated as 'potentially contaminated land'. Then receptors, such as humans, animals, fish, birds and habitats, which could potentially be affected, were identified.

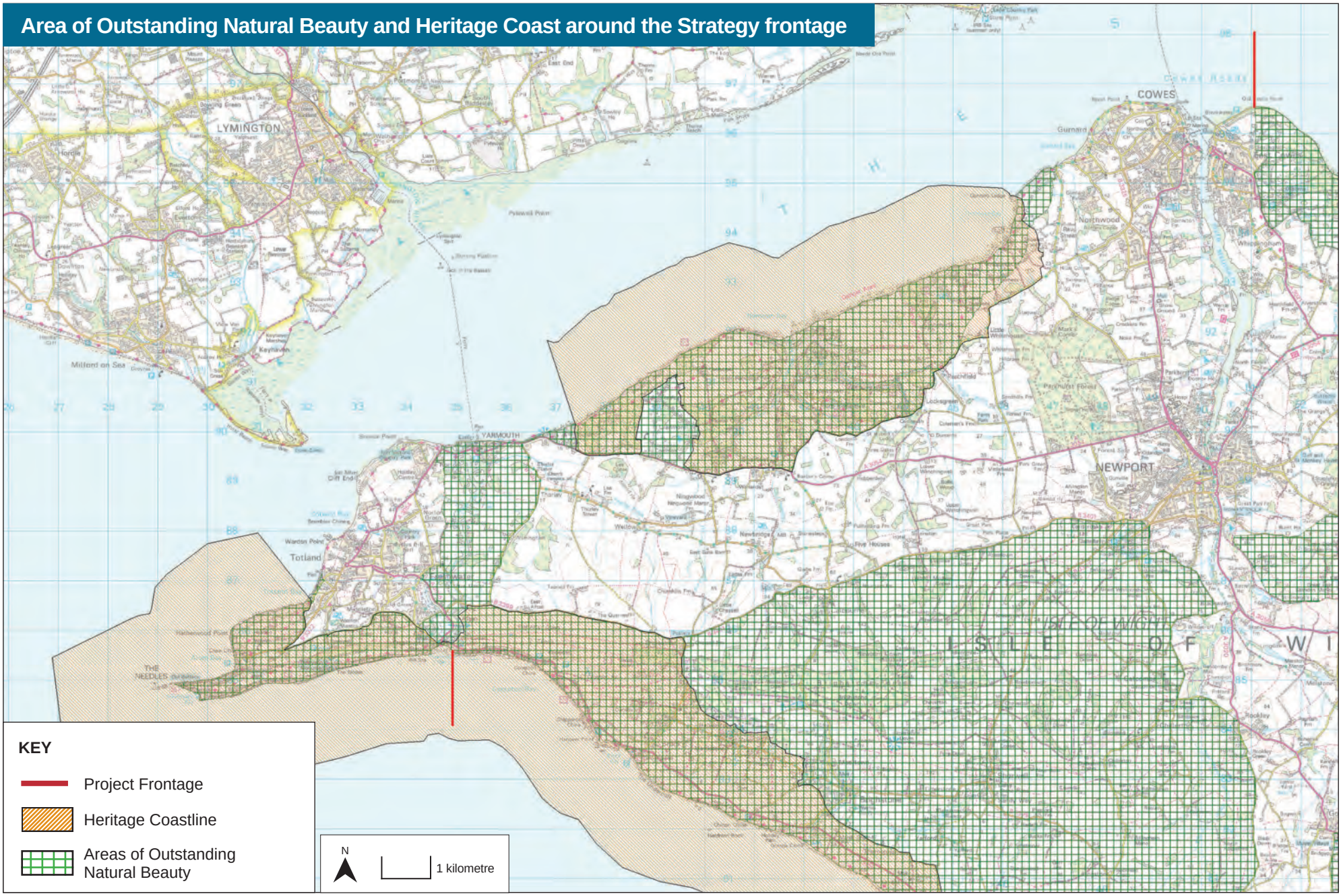
Next, with use of the erosion predictions, and the flood mapping, the likelihood of the 'potentially contaminated land' areas being at risk of eroding or flooding was established.

Following this approach, the desktop study identified areas where there is a high risk of contaminants being released in the future (see Appendix B for full details). The sites identified as high risk in this review were considered in the appraisal of options; however it is noted that due to either an inert status or lack of identified pathways to link sources to receptors these sites have not significantly influenced strategy option choices.

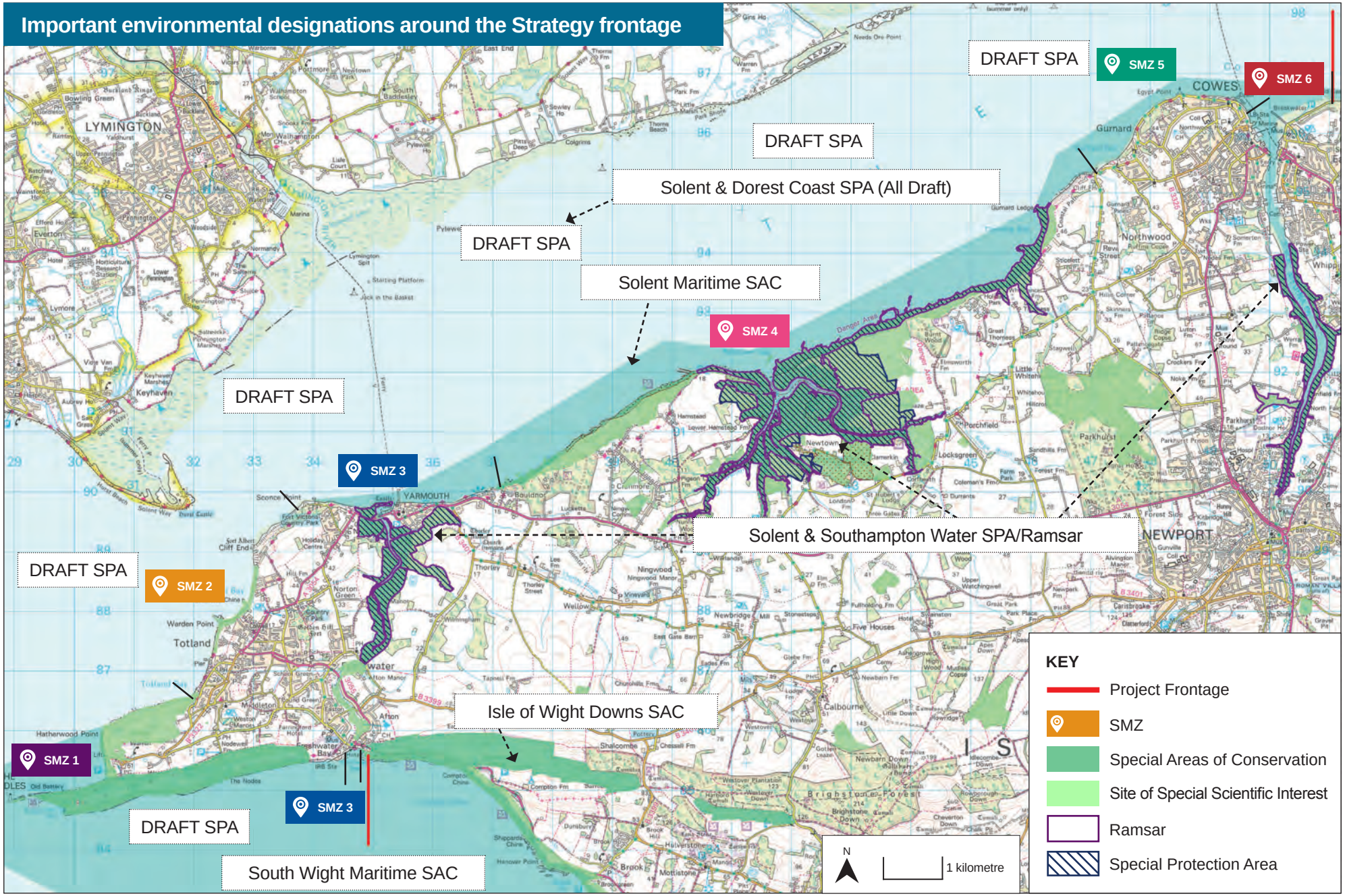
It should be noted that any future coastal defence works near or in potentially contaminated sites should include a more detailed assessment of the contamination risk as part of the Project Appraisal process.

For more information see Appendix B: Desktop Contaminated Land Review

Area of Outstanding Natural Beauty and Heritage Coast around the Strategy frontage



Important environmental designations around the Strategy frontage



Environment and heritage designations

West Wight has an abundance of natural features and open spaces. The largely unspoilt, unique and iconic nature of the landscape around Freshwater Bay, the Needles, the Western Yar Valley and the Hamstead coast has been recognised through designation as an Area of Outstanding Natural Beauty and also as a Heritage Coast.

A number of internationally important sites (see figure left) are found within the area, including Ramsar sites, Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Areas of national importance, such as Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR) can also be found. Many of these important sites are situated along the Strategy coastline and as such it was essential to consider these areas when developing the Strategy.

Within many of these important sites there are a number of different habitats such as marshes, reed-beds, lagoons and intertidal sand and mudflats which support a wide diversity of wildlife. The intertidal mudflats are particularly important feeding habitat for birds, whilst other areas such as the Medina, Yar and Newtown Creek provide an important habitat and nursery area for fish such as bass, flounders and mullet.

Unfortunately, with predicted sea level rise, there will be increasing pressure on many of the important intertidal habitats which get ‘squeezed’ against coastal defence structures such as seawalls. This can decrease the size and health of the intertidal habitats and place additional stresses on the species that rely upon them. These natural features and associated wildlife also draw and support significant numbers of visitors for walking, cycling, ornithology, fishing and other recreation.

To help offset these anticipated losses in the future, it is essential for the Strategy to consider environmental enhancement opportunities. Particular areas signposted for potential environmental mitigation and/or enhancement along the frontage include Thorley Brook (Yarmouth) and southwest of the Causeway (eastern Freshwater). In addition, allowing natural process to continue where possible is of utmost importance to ensure the coastline and habitats change and evolve naturally over time.

There are also a range of heritage assets around the West Wight coastline (including 6 Scheduled Monuments and over 100 Listed Buildings) and the risk of flooding and erosion to these features has been recognised in the development of the preferred options in the Strategy.

Stakeholder engagement – understanding what people want from the coast

Many individuals and organisations have a key interest or stake in the Strategy shoreline for many different reasons. Each stakeholder is therefore likely to have a unique view on its use, development and future protection. Stakeholders or consultees can be an indispensable source of information which can define coastal issues and objectives, steer Strategy development and achieve consensus on the future management of the shoreline.

A key part of developing the Strategy has involved engaging with key stakeholders. This has been achieved through public workshops, a dedicated key stakeholder bus tour of the frontage, the establishment of a project Steering Group, and through specific meetings. This has ensured local communities and working groups, Harbour Authorities, potential developers, local planners, Natural England, the Environment Agency, Historic England and public bodies with a vested interest in the West Wight coastline have all been consulted and involved.

The overall strategic aims of the Strategy engagement process were;

- to raise an awareness and understanding of coastal flood and erosion risk,
- to identify the challenges and constraints, and
- to involve others in the decision making process for managing the coastline.

Early in the Strategy development phase two dedicated stakeholder workshops were held in Yarmouth and Cowes to raise awareness of the Strategy, the problem being addressed and the new system of partnership funding for future coastal defences. The workshops were well attended by over 80 people and important stakeholder feedback was obtained on potential issues and opportunities for the Strategy to consider.

In addition to the stakeholder workshop the Strategy team have held discussions with a number of individuals and organisations to discuss the project and to learn more about any concerns and aspirations they might have with regards to the coastline.
The Strategy team have learnt a huge amount about how people wish to see the shoreline evolve. All of the feedback received to date, where relevant, has been used to inform the development of the Strategy to ensure that it takes account of, and captures key stakeholder input and ideas.

The Strategy undertook a three month period in public consultation in spring 2016. During this time key stakeholders and the public were invited to view the proposal and attend public exhibitions to review and provide feedback on the draft Strategy proposals, which was used to review and finalise the approaches set out in this report.

For more information see Appendix E: Stakeholder Engagement Feedback

Summary of the existing defences

To help establish the baseline flood and erosion risk along the Strategy frontage it was necessary to identify the standard of protection offered by the existing coastal defences, their condition, and how long they are likely to last without maintenance. This was done by undertaking a walkover survey of the Strategy shoreline and reviewing the thorough visual assessment of defence condition undertaken by IWC in line with the Environment Agency's Defence Condition Assessment Manual.

Given the number of towns, dwellings and important coastal features, for example in Cowes and Yarmouth, a significant portion (around 20km) of the Strategy shoreline is currently defended. There is a wide range of different defence types, from low sea walls and quays lining the sheltered estuarine and creek areas to large sea walls and esplanades along the more exposed open coast to protect against erosion and wave overtopping. There are also stretches of private structures lining waterfronts of residential and commercial properties, providing individual waterside access and a managed (man-made) shoreline, although often not constructed as defence structures originally. In addition, the open coast is afforded protection by the beaches which act as a barrier to the waves. There are also long undefended areas with 'no formal defences'. In these areas, cliff erosion is often a key risk.

Typically, many of the defences are in a fair condition. There are also some sections of new defence in very good condition. However, there are also some notable areas where the defences are in a poor state or provide a low standard of protection against flooding and erosion e.g. Totland, and parts of Yarmouth and Cowes.

For more information see Appendix A: Defence Condition Review

Option Development

Overview

Following defining the baseline risks (if we 'do nothing'), and having gained a detailed understanding of the processes, features and issues operating along the coast, the development and appraisal of strategic management options was undertaken.

The 'option appraisal process' refers to the tasks involved in selecting the preferred management options along the Strategy frontage. The process followed the Environment Agency's National Flood and Coastal Erosion Risk Management guidelines.

Coastal flood and erosion risk management options have been considered on two interlinked levels; the strategic level options and the local level measures required to implement these options.

Thinking strategically – management zones

The Strategy frontage was divided into six zones; termed Strategy Management Zones (SMZs). Each zone (and sub-zone where required) is characterised by consistent themes and characteristics such as coastal processes, levels of flood and erosion risk, land uses and Shoreline Management Plan policies. The SMZ areas are shown on the map on page 5 and presented in the table on pages 40 and 41.

For each SMZ, strategic level options were developed and appraised against technical, economic, social and environmental criteria. The preferred options for consultation were chosen on the basis of this evaluation.

Option Development Units and identifying potential local measures

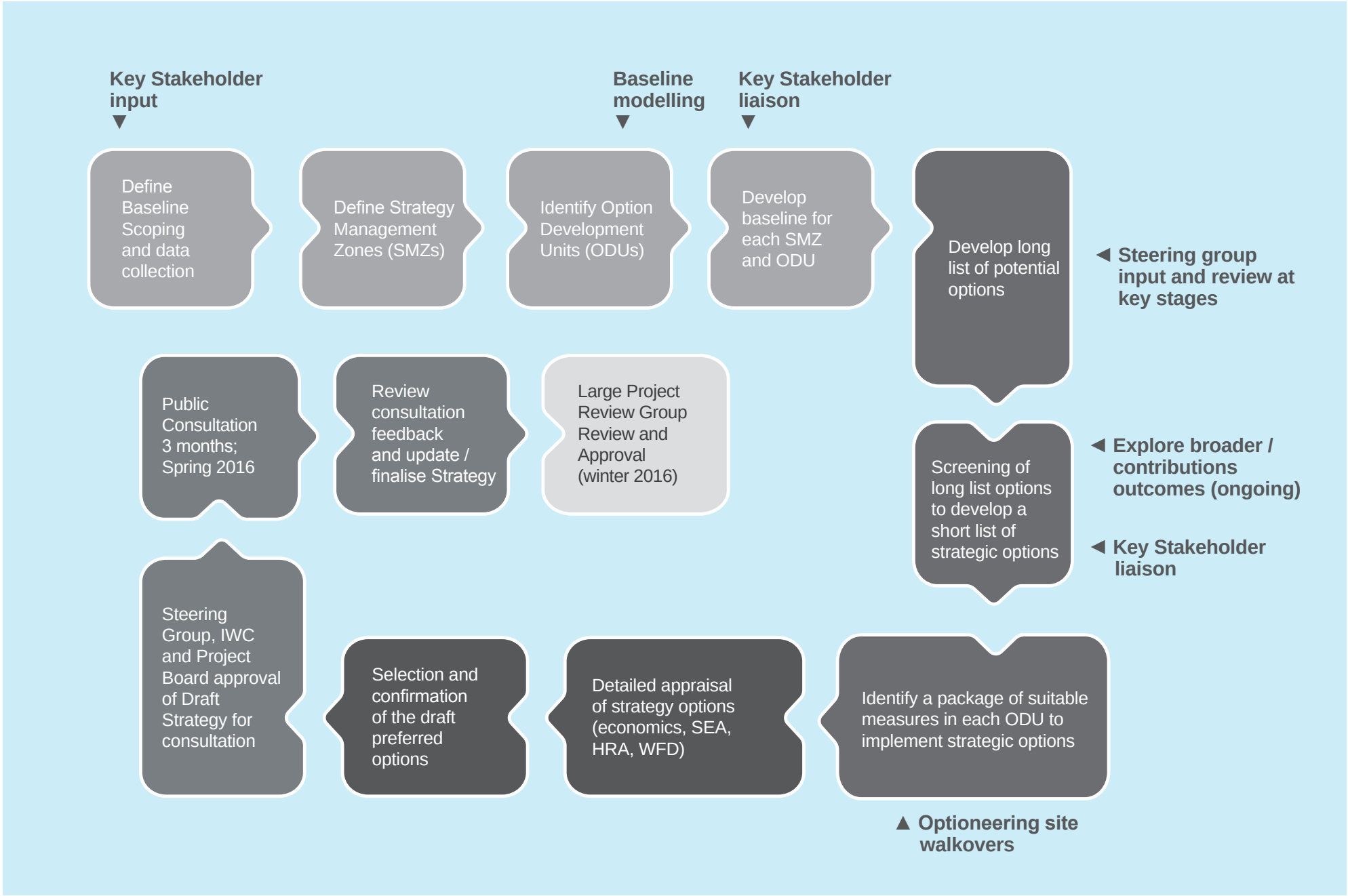
To ensure that the management options proposed by the Strategy are robust and relevant at the local level it was necessary to split the SMZ frontages into smaller units (termed Option Development Units). This provided the flexibility to refine the strategic options to account for local level variations and requirements.

In total 32 Option Development Units (ODUs) were devised mainly following the Shoreline Management Plan Policy Units. For clarity, these are numbered 1 to 32 clockwise around the coast (and labelled 'W' for the 'West Wight' Strategy. The ODUs are shown on the map on page 51). Within each of these units the 'packages of measures' necessary to implement the wider strategic options were established. Each 'package' outlined the type of management intervention or works required over three time periods to implement the strategic option for the next 100 years.

The locations and key characteristics of each unit are summarised in a table on pages 35 to 39. The boundaries of each unit are shown in the maps in Chapters 5 to 10.

A workflow summary of the option development process, and subsequent stages, is presented on the opposite page. The following sections provide a commentary of the key aspects of the process.

For more detail see Appendix J: Option Development and Appraisal



Overview of Strategy development activities

Overview table of Option Development Units (ODUs)

ODU	Unit Name	SMP PU	SMP Policy to			Defence Residual Life (years)	Frontage Maintainer	Indicative Erosion Risk (years from now)			Indicative Flood Risk (years from now)			Coastal Processes	Land Use
			2025	2055	2115			0-10	10-40	40-100	0-10	10-40	40-100		
W1	Tennyson Down, Alum Bay and Headon Warren	PU6A.2	NAI	NAI	NAI	Undefended	National Trust + Private							High wave energy, exposed cliff line	Open space, attractions (Needles Park), farmland, coastal footpath
W2	Southern and Central Totland Bay	PU6B.1	HTL	HTL	HTL	<10-20+	IWC + Private							High wave energy	Recreation, residential
W3	Northern Totland Bay	PU6B.1	HTL	HTL	HTL	<10-20+	IWC + Private							High wave energy	Recreation, residential
W4	Southern Colwell Bay	PU6B.1	HTL	HTL	HTL	10-20+	IWC + Private							High wave energy	Recreation, residential
W5	Central Colwell Bay	PU6B.2	NAI	NAI	NAI	Undefended	Private							High wave energy, net sediment movement is from southwest to northeast	Recreation, holiday parks, residential (holiday homes), open space
W6	Fort Albert	PU6B.3	HTL	HTL	NAI	Mainly 10-20+	IWC + Private							High wave energy	Residential (holiday Homes), open space
W7	Fort Victoria Country Park	PU6B.4	NAI	NAI	NAI	Undefended	Private							Relatively high wave energy	Open space (woodland)
W8	Fort Victoria and Norton	PU6B.5	HTL	NAI	NAI	<10-20+	IWC + Private							Low wave energy (fetch limited)	Residential, recreation (resort leisure club)

KEY

SMP Policy: HTL = Hold the Line;
NAI = No Active Intervention; MR = Managed Realignment

Erosion & Flood risk: Indicative risk to people or assets under a 'Do Nothing' Scenario'

Low Moderate High

Overview table of Option Development Units (ODUs) continued															
ODU	Unit Name	SMP PU	SMP Policy to			Defence Residual Life (years)	Frontage Maintainer	Indicative Erosion Risk (years from now)			Indicative Flood Risk (years from now)			Coastal Processes	Land Use
			2025	2055	2115			0-10	10-40	40-100	0-10	10-40	40-100		
W9	Norton Spit	PU6C.1	HTL	HTL	HTL	10-20	Private							Low wave energy (fetch limited)	Recreation, harbour
W10	Western Yar Estuary - western shore	PU6C.2	NAI	NAI	NAI	Mainly Undefended	Private							Estuarine, sheltered	Recreation (boat yard), farmland
W11	The Causeway	PU6C.3	HTL	HTL	HTL	10-20+	Environment Agency							Estuarine, sheltered	Residential, open space
W12	Freshwater Bay	PU6A.1	HTL	HTL	HTL	10-20+	IWC + Private							Bay receives sediment from the west. Accretion in middle, erosion at flanks. High wave energy	Recreation, residential (apartments)
W13	Western Yar Estuary - eastern shore	PU6C.4	NAI	NAI	NAI	Undefended	IWC							Estuarine, sheltered	Farmland, cyclepath
W14	Thorley Brook and Barnfields Stream	PU6C.5	HTL	MR	NAI	15-20+	Environment Agency, IWC + Private							Estuarine, sheltered	Open space (nature conservation)
W15	Thorley Brook to Yar Bridge	PU6C.6	HTL	HTL	HTL	15-20+	IWC + Private							Estuarine, sheltered	Residential, recreation, school

KEY

SMP Policy: HTL = Hold the Line; NAI = No Active Intervention; MR = Managed Realignment

Erosion & Flood risk: Indicative risk to people or assets under a 'Do Nothing' Scenario'

Low | Moderate | High

Overview table of Option Development Units (ODUs) continued

ODU	Unit Name	SMP PU	SMP Policy to			Defence Residual Life (years)	Frontage Maintainer	Indicative Erosion Risk (years from now)			Indicative Flood Risk (years from now)			Coastal Processes	Land Use
			2025	2055	2115			0-10	10-40	40-100	0-10	10-40	40-100		
W16	Yar Bridge to Yarmouth Common	PU6C.6	HTL	HTL	HTL	Mainly 15-20+	Private							Low wave energy (fetch limited)	Harbour including ferry terminal, behind the harbour are commercial and residential properties
W17	Yarmouth Common to Port la Salle	PU6C.6	HTL	HTL	HTL	<10-20+	IWC + Private							Low wave energy (fetch limited)	Recreation, residential
W18	Bouldnor Copse and Hamstead	PU7.1	NAI	NAI	NAI	Undefended	Private							Low wave energy (fetch limited)	Open space (woodland), limited residential properties
W19	Newtown Estuary	PU7.2	NAI	NAI	NAI	Undefended	National Trust + SERFCA + Private							Mostly estuarine, locally littoral drift is from both sides towards the inlet / spits	Nature reserve, farmland, some small residential areas
W20	Thorness Bay and southern Gurnard Bay	PU7.3	NAI	NAI	NAI	Undefended	Private							Low wave energy (fetch limited)	Recreation (holiday park), farmland, woodland, some small residential areas
W21	Gurnard Luck	PU1A.1	HTL	NAI	NAI	<10-20+	Private + Environment Agency							Low wave energy (fetch limited)	Residential, harbour
W22	Gurnard Cliff	PU1A.2	NAI	NAI	NAI	Undefended	Private							Low wave energy (fetch limited)	Woodland, residential area on top of the cliff

KEY

SMP Policy: HTL = Hold the Line; NAI = No Active Intervention; MR = Managed Realignment

Erosion & Flood risk: Indicative risk to people or assets under a 'Do Nothing' Scenario'

Low | Moderate | High

Overview table of Option Development Units (ODUs) continued															
ODU	Unit Name	SMP PU	SMP Policy to			Defence Residual Life (years)	Frontage Maintainer	Indicative Erosion Risk (years from now)			Indicative Flood Risk (years from now)			Coastal Processes	Land Use
			2025	2055	2115			0-10	10-40	40-100	0-10	10-40	40-100		
W23	Gurnard to Cowes Parade	PU1A.3	HTL	HTL	HTL	Mainly 15-20+	IWC + Private							Low wave energy (fetch limited), weak net eastwards littoral drift, landslide reactivation potential	Residential, recreation (beach huts), commerical
W24	Cowes Town Centre to Fountain Yard	PU1A.4	HTL	HTL	HTL	15-20+	Private							Low wave energy (fetch limited)	Residential, commerical (large High Street)
W25	Cowes (Fountain Yard to Medina Wharf)	PU1A.4	HTL	HTL	HTL	Mainly 15-20+	Private							Mostly estuarine, sheltered	Industrial properties with residential streets landward, commercial buildings, harbour, wharfs and a ferry terminal
W26	Central Medina - northwest shore	PU1B.1	NAI	NAI	NAI	Undefended	IWC + Private							Estuarine, sheltered	Farmland, cyclepath
W27	West Medina Mills	PU1B.2	HTL	HTL	HTL	10-20+	Private							Estuarine, sheltered	Small industrial area, with private defences
W28	Central Medina - southwest shore	PU1B.3	NAI	NAI	NAI	Mainly Undefended	IWC + Private							Estuarine, sheltered	Farmland, small residential areas, industrial area to the south is setback from the frontage

KEY

SMP Policy: HTL = Hold the Line;
NAI = No Active Intervention; MR = Managed Realignment

Erosion & Flood risk: Indicative risk to people or assets under a 'Do Nothing' Scenario'

Low Moderate High

Overview table of Option Development Units (ODUs) continued															
ODU	Unit Name	SMP PU	SMP Policy to			Defence Residual Life (years)	Frontage Maintainer	Indicative Erosion Risk (years from now)			Indicative Flood Risk (years from now)			Coastal Processes	Land Use
			2025	2055	2115			0-10	10-40	40-100	0-10	10-40	40-100		
W29	Newport Harbour	PU1B.4	HTL	HTL	HTL	10-20+	IWC + Private							Estuarine, sheltered	Industrial areas, harbour, commercial, residential
W30	Central Medina - eastern shore	PU1B.5	NAI	NAI	NAI	Mainly Undefended	IWC + Private							Estuarine, sheltered	Farmland, waste water pumping station, recreation (harbour and holiday park), disused industrial facility
W31	East Cowes (Kingston Road Power Station to Shrape Breakwater)	PU1A.5	HTL	HTL	HTL	Mainly 15-20+	Private							Low wave energy (fetch limited)	Industrial facilities (including fuel depot and power station), residential, commericial buildings and wharfs, harbour, ferry terminal
W32	East Cowes outer Esplanade (Shrape Breakwater to Old Castle Point)	PU1A.6	HTL	NAI	NAI	15-20+	IWC							Low wave energy (fetch limited)	Recreation area with residential properties landward, woodland

KEY

SMP Policy: HTL = Hold the Line;
NAI = No Active Intervention; MR = Managed Realignment

Erosion & Flood risk: Indicative risk to people or assets under a 'Do Nothing' Scenario'

Low Moderate High

Summary of the Management Zones						
Zone	**1**	**2**	**3a**	**3b**	**3c**	**4**
Name	**Needles Headland**	**Totland and Colwell Bays**	**Yarmouth Coast**	**Western Yar Estuary**	**Freshwater**	**Newtown Coast**
Geographic Extent	Fort Redoubt to southern limit of Totland Bay	Southern limit of Totland Bay to Fort Victoria	Yarmouth town and Fort Victoria to Port la Salle	Western Yar Estuary shoreline including Thorley Brook and Barnfields Stream	Freshwater Bay, Freshwater Village and the Causeway	Bouldnor cliff to Thorness Bay, including Newtown Estuary
Option Development Units	W1	W2 to W7	W8 to W9 and W15 to W17	W10, W13 and W14	W11 and W12	W18 to W20
SMP Policy (2011)	No Active Intervention	Mixed (Hold the Line in the south. Transferring from Hold the Line to No Active Intervention in the north)	Mixed (Hold the Line around Yarmouth and to the east. Transferring from Hold the Line to No Active Intervention in the west)	No Active Intervention, with Managed Realignment at Thorley Brook	Hold the Line	No Active Intervention
Zones Characterised by (Common themes / issues)	• Undefended, cliffed coastline • Exposed to large waves • Small number of assets at risk from erosion at the clifftop • No flood risk • Leisure / recreational use	• Cliffs subject to landsliding • Residential and commercial properties at risk of erosion • Popular recreational area • No flood risk	• Yarmouth is a key residential area and town centre • Significant flood and erosion risks • Roads that provide access to other parts of the Island at risk from flooding and erosion • Ferry terminal provides link to mainland	• Recreation area and farmland • Cyclepath situated on the eastern side of the estuary • Predominantly undefended • Small and localised flood and erosion risks • Mostly sheltered and estuarine	• Residential and commercial properties at risk from flooding • Low lying area at flood risk between Causeway and Freshwater Bay • Freshwater Bay exposed to large swell waves that can result in overtopping of the defences • Erosion risk at Freshwater Bay • A3055 at risk of flooding	• Open space • Undefended • Environmentally important area • Small localised risk of erosion • No flood risk

Summary of the Management Zones (continued)					
Zone	**5a**	**5b**	**6a**	**6b**	**6c**
Name	**Gurnard Luck and Gurnard cliff**	**Gurnard to Cowes Parade**	**Cowes and East Cowes**	**Medina Estuary (and East Cowes Outer Esplanade)**	**Newport Harbour**
Geographic Extent	Gurnard Luck / Gurnard marsh area	Cowes headland, from Gurnard Bay to Cowes Parade	Cowes: Cowes Parade to Medina Wharf. East Cowes: Shrape breakwater to Kingston Road power station	Medina Wharf and Kingston Road Power Station south to Newport Harbour and Shrape Breakwater to Old Castle Point	Newport Harbour and quayside
Option Development Units	W21 to W22	W23	W24 to W25 and W31	W26 to W28, W30, W32	W29
SMP Policy (2011)	Mixed (Hold the Line changing to No Active Intervention at Gurnard Luck. No Active Intervention to the east)	Hold the Line	Hold the Line	Mixed (mainly No Active Intervention, plus Hold the Line at West Medina Mills and Hold the Line transferring to No Active Intervention at East Cowes outer esplanade)	Hold the Line
Zones Characterised by (Common themes / issues)	• Significant risk of flooding at Gurnard Luck • Erosion risk because of the close proximately of properties to the coastline • Existing private defences have relatively low crest levels	• The developed coastal slopes have potential for landslide reactivation • Erosion is more of a significant risk than flooding • There are existing sea wall defences, overtopped at low points at high tide events	• Cowes and East Cowes are key urban centres • Significant residential and commercial properties at risk from both flooding and erosion • Waterfront access is important • Two ferry terminals provide links to the mainland	• Land is predominantly farmland and recreational land • Small landslides have blocked access near Old Castle Point • Few properties at risk from flooding and erosion	• Waterfront access is important • Commercial and industrial properties close to the waterfront and at risk of flooding • If the harbour walls failed a number of properties are at risk of damage

Seawall

Earth Embankment

Image courtesy by Fluvial Innovations

Temporary Flood Barriers

Setback Floodwall

Steel Sheet Piling

Armorloc Revetement

Property Level Protection

Timber Clad Sheet Pile Wall

Beach Nourishment/Recycling

Groynes

Land raising

Rock Revetment

Potential measures to implement the strategic management options

Developing the Strategic Options

In order to be able to assess the relative merits of different Strategy options, the baseline flood and erosion risks associated with a 'Do Nothing' approach were derived in each SMZ for the present day, 2025, 2055 and 2115. This allowed the risk areas within each SMZ to be identified, and the timing of risks to be defined. This understanding formed a basis from which to develop a number of potential 'strategic options' for the management of flood and erosion risk. The scope, or long list, of strategic options considered across the SMZs included:

- **Do Nothing** – no active intervention (baseline scenario developed in each SMZ).
- **Do Minimum** – e.g. maintain health and safety obligations, minor reactive maintenance / repairs.
- **Maintain** – continue to protect against erosion. However, the standard of protection (SoP) against flooding would be expected to fall over time as sea levels rise.
- **Adaptation / resilience / relocation** – through the implementation of a coastal change management area plan.
- **Sustain** – maintain a minimum SoP by raising defences over time to keep pace with sea level rise.
- **Improve SoP** – improve the SoP compared to the present day.
- **Environmental mitigation / Improvement** – including managed realignment and habitat creation.

Variations of the above options were also considered.

From the long list of strategic options, a short list of potentially suitable methods for achieving them were selected and defined for appraisal in each SMZ (typically four or five of the most appropriate methods were identified for each SMZ). A table summarising the potential strategic options assessed for each SMZ is presented in the following table,

Strategic options considered for each Strategy Management Zone (SMZ):
SMZ 1 (W1) Potential Strategic Options Needles Headland
Do nothing – No active intervention. Baseline scenario.
SMZ 2 (W2 – W7) Potential Strategic Options Totland and Colwell Bays
Do nothing – No active intervention. Baseline scenario.
Do minimum – Maintain H&S and access as long as possible and develop coastal change management area plan (W2-W6).
Maintain then Improve from 2025 – Phased seawall improvement and cliff stabilisation. Maintain defences (W2-W4) until end of design life then implement phased cliff drainage and sea wall stabilisation works (for example a mass rock revetment). Do minimum elsewhere.
Improve (now) – Seawall stabilisation works (for example a mass rock revetment) and cliff stabilisation and drainage now (W2-W4). Do minimum elsewhere.
SMZ 3a (W8-9, W15-17) Potential Strategic Options Yarmouth coast (Fort Victoria to Port la Salle)
Do nothing – No active intervention. Baseline scenario.
Do minimum – H&S and access. Flood warning and emergency response plan.
Maintain (and Temporary Flood Barriers) then Improve from 2055 – Use Temporary Flood Barriers to manage and reduce flooding to areas at significant risk by sustaining a 1 in 75 year (1.33 % AEP) standard of protection. Prevent erosion to critical infrastructure serving the town and the West Wight. From 2055, if funding can be secured, raise / implement new defences (bunds and floodwalls) to manage long term increase in flood and erosion risk posed by sea level rise.
Maintain (and PLP) then Improve from 2055 – Use Property Level Protection to manage and reduce flooding to residential properties at very significant risk. Prevent erosion to critical infrastructure serving the town and the West Wight. From 2055, if funding can be secured, raise / implement new defences (bunds and floodwalls) to manage long term increase in flood and erosion risk posed by sea level rise.
Improve (now) – Raise / implement new defences (bunds and floodwalls) now to manage longer term increase in flood and erosion risk posed by sea level rise.

SMZs 3,4, 5 and 6 overleaf ►

Strategic options considered for each Strategy Management Zone (SMZ) (continued):

SMZ 3b (W10, W13-14) Potential Strategic Options
Western Yar Estuary

Do Nothing – No active intervention. Baseline scenario.

Do Minimum – H&S and access (minor repairs to cyclepath i.e. debris removal).

Do Minimum with Managed Realignment between 2025 and 2055 – Maintain existing structures, H&S and cycle and footpath access. If funding can be secured, managed realignment at Thorley Brook between 2025 and 2055 to provide environmental mitigation and create intertidal habitat.

Maintain – Maintenance of existing structures (including cycle path repairs) and refurbishment at end of design life.

SMZ 3c (W11-12) Potential Strategic Options
Freshwater (The Causeway and Freshwater Bay)

Do Nothing – No active intervention. Baseline scenario.

Do Minimum – H&S and access. Flood warning and emergency response plan.

Adaption and Resilience (and PLP) / Do Minimum – Recommend Property Level Protection and flood warning / emergency response plan for residential properties at very significant risk.

Maintain (and PLP) then Improve (2055) – Maintenance of existing structures and recommend Property Level Protection to the residential properties at significant flood risk. Refurbishment of existing defences at Freshwater Bay at end of design life to prevent erosion risk and implement new defences at Freshwater Village in the long term to mitigate flood risk and improve the standard of protection.

Maintain and Improve (now) – Maintain existing defences at Freshwater Bay, improve standard of protection at Freshwater Village. Refurbishment and Improve existing defences at end of design life at Freshwater Bay to mitigate erosion risk and implement new defences at Freshwater Village to improve the standard of flood protection.

SMZ 4 (W18-20) Potential Strategic Options
Newtown Coast

Do nothing – No active intervention. Baseline scenario.

SMZ 5a (W21-22) Potential Strategic Options
Gurnard Luck and Gurnard cliff

Do Nothing – No active intervention. Baseline scenario.

Do Minimum – H&S and access. Provide flood warning and emergency response plan.

Do Minimum and Resilience then Adapt – Recommend community and property level flood resistance and resilience at Gurnard Luck. Private maintenance of existing assets permitted (subject to usual consents). In the long term flood risk will increase due to sea level rise but provide a coastal change management area plan to support the SMP (2010) No Active Intervention Policy. Do minimum (maintain H&S) at Gurnard cliff.

Maintain – Maintenance of existing structures at Gurnard Luck and refurbishment at end of design life. Flood risk will increase over time due to sea level rise. Develop flood warning and emergency response plan. Do minimum (maintain H&S) at Gurnard cliff.

SMZ 5b (W23) Potential Strategic Options
Gurnard to Cowes Parade

Do Nothing – No active intervention. Baseline scenario.

Do Minimum – Maintain H&S and access and also provide coastal change management area plan.

Maintain – Maintenance of existing structures and refurbishment or replacement at the end of their residual life to reduce risks of erosion and landslide reactivation. Flood risk will increase due to sea level rise.

Improve (now) – Implement seawall stabilisation works along Cowes – Gurnard to reduce erosion risk and increase standard of flood protection.

SMZ 6a (W24-25, W31) Potential Strategic Options
Cowes and East Cowes

Do Nothing – No active intervention. Baseline scenario.

Do Minimum – H&S and access. Provide flood warning and emergency response plan.

Do Minimum (and PLP) then Adapt – Recommend Property Level Protection for residential properties at very significant risk and maintain H&S and access. Adapt and provide flood warning / emergency response plan.

Maintain – Maintenance of existing structures and refurbishment at end of design life. Accept standard of protection will fall over time.

Strategic options considered for each Strategy Management Zone (SMZ) (continued):
Sustain (with Temporary Flood Barriers and PLP) then Improve from 2055 – In the short and medium term maintain the existing defences and use Temporary Flood Barriers and Property Level Protection to sustain a 1 in 75 year (1.33% AEP) standard of protection in the areas at significant flood risk. Use redevelopment opportunities to facilitate the raising / implementation of new strategic defences. In the long term (from 2055), if the funding can be secured, implement new defences such as seawalls or setback floodwalls to manage the increase in flood and erosion risk posed by sea level rise.
Sustain (with PLP) then Improve from 2055 – In the short and medium term maintain the existing defences and use Property Level Protection and a flood warning / emergency response plan (no Temporary Flood Barriers) to manage and reduce flooding to residential properties at significant risk. Use redevelopment opportunities to facilitate the raising / implementation of new strategic defences. In the long term (from 2055), if the funding can be secured, implement new defences such as seawalls or setback floodwalls to manage the increase in flood and erosion risk posed by sea level rise.
Improve (now) – Replace and raise frontline defences to provide a 1 in 200 year (0.5% AEP) standard of protection.
SMZ 6b (W26-28, W30, W32) Potential Strategic Options Medina Estuary (and East Cowes Outer Esplanade)
Do Nothing – No active intervention. Baseline scenario.
Do Minimum – H&S and access.
Maintain – Maintenance of existing structures and refurbishment at end of design life. Accept standard of protection against flooding will fall over time due to sea level rise.
SMZ 6c (W29) Potential Strategic Options Newport Harbour
Do Nothing – No active intervention. Baseline scenario.
Do Minimum – Maintain H&S and access. Provide flood warning and emergency response plan.
Maintain (and PLP) then Improve from 2055 (through redevelopment) – In the short term recommend Property Level Protection to manage and reduce flooding to the few residential properties at very significant risk. Maintain then refurbish existing defences once they reach the end of their service life. In the long term use redevelopment opportunities to facilitate the raising / implementation of new strategic defences to improve the standard of flood protection.
Maintain (and PLP) then Improve from 2055 (through a frontline scheme) – In the short term recommend Property Level Protection to manage and reduce flooding to the few residential properties at very significant risk. Maintain then refurbish existing defences once they reach the end of their service life. A new frontline scheme from 2055 to improve the standard of flood protection.
Improve (now) – Raise / implement new frontline defences to manage longer term increase in flood risk posed by sea level rise.

Strategic Option Appraisal

The next stage in the Strategy development process was to appraise the strategic options to select the preferred option for each SMZ. This appraisal process included an economic appraisal (Benefit : Cost analysis), a number of environmental assessments, social and technical appraisals and a consideration of funding and affordability. This process was undertaken to ensure that the preferred options put forward are economically viable and deliverable, meet the Strategy objectives and are technically robust, socially acceptable and environmentally sustainable.

Technical aspects

A primary consideration in the development of a Strategy is to know which proposals are technically viable. There is little point in undertaking detailed economic and environmental appraisals, or recommending an option, if the option in question cannot reasonably be implemented on the ground.

Technical considerations include the defence type in question, timing of works, space and height requirements, all in the context of the specific location and present condition of the site in question.

For example, for a currently undefended, open space location, there are few technical issues and a wide range of options are likely to be technically viable (e.g. revetments, seawalls, land raising, floodwalls, earth bunds etc.). However, for a more constrained site, such as

a dense urban environment where space may be very limited, significant technical challenges may be present for many options (e.g. land raising or earth bunds which require space) and may limit the technically feasible options to those such as a floodwall which require a smaller footprint to implement.

In order to be able to assess the technical feasibility of options a sound appreciation of the coastline was therefore required. This was achieved through the baseline assessments undertaken. In addition, numerous site walkovers were carried out to assess the practical and technical constraints offered along the coastline in respect to the various local measures identified. This understanding of the Strategy area, coupled with the project team's extensive engineering judgement, allowed the technical feasibility of options to be appraised.

Social aspects

Stakeholder engagement with key organisations was undertaken during the development of the options. This included a bus tour of the frontage with key stakeholders and as well as dedicated stakeholder workshops. There continues to be ongoing liaison with many of the organisations along the frontage. The feedback and information received during Strategy development provided a clear understanding of stakeholder needs, desires and opportunities to deliver wider outcomes. A number of recurring and common themes and aspirations were raised by stakeholders for the Strategy to consider. These include (not in order of importance):

- Robust flood and erosion risk management – protecting key assets and people
- Maintain critical infrastructure and the ferry links to the Island
- Maintaining and improving coastal access (i.e. walking, cycling, fishing, nature watching and leisure pursuits)
- Maintaining waterfront connectivity, links to the sea and improving harbour facilities
- Safeguarding cultural and natural heritage assets
- Protecting, enhancing and creating environmentally important sites
- Maintaining recreational space areas
- Keeping natural areas unspoilt
- Maintaining the Islands tourism economy
- Linking new defences with redevelopment opportunities

The option appraisal process accounted for these aspirations and the intent of the preferred options is to support and facilitate these where possible.

Environmental aspects

With so many environmentally and culturally important areas and designations on the Island, key environmental considerations and objectives helped shape the preferred strategic options. This was achieved through a Strategic Environmental Assessment (SEA) which was undertaken as an integral part of the option appraisal process (see Appendix G). The SEA appraised the potential impacts of each short listed strategic option against the following categories:

- Biodiversity
- Climate
- Cultural heritage
- Human health
- Landscape
- Material assets
- Soil
- Water

The interrelationship between each of the above categories was also considered.

The environmental appraisal information was included as part of the evidence for selecting the preferred option. Where possible it is intended that the preferred options should not significantly detriment the achievement of the environmental objectives of the Strategy. However, if they do, suitable mitigation or compensation must be identified in order to ensure the options are environmentally acceptable.

Economic appraisal

An economic assessment formed an essential part of the selection of the preferred options. Although the preferred option does not necessarily have to be the most cost effective option (because there are many other determining factors, e.g. social and environmental drivers), it is however important to make sure the preferred option makes economic sense (i.e. the benefits of doing something outweigh the costs of the work).

$$\text{Benefit : Cost ratio} = \frac{\text{Total Benefit}}{\text{Total Cost}}$$

The strategic options were subjected to economic testing during the appraisal. The assessment involved an estimation of the Average Benefit : Cost ratio of each strategic option.
In zones where the selection process was driven by flood risk, the Incremental Benefit : Cost ratio was also utilised. Please note that costs and benefits throughout this document are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

The costs of a strategic option were estimated based on the defence types (as indicated by the 'package of measures') and the defence lengths and heights required. The flood and erosion benefits of a strategic option were determined by calculating the damages avoided compared to the baseline 'Do Nothing' scenario.

Generally speaking, the higher the Average Benefit : Cost ratio, the greater the economic viability of a strategic option. The Average Benefit : Cost ratio was used as a tool to help inform the decision. As long as an option had an Average Benefit : Cost ratio greater than 1 (i.e. the benefits outweigh the costs) then it was deemed economically viable. Sometimes more costly options provide additional benefits, and if these represent better value over a less expensive option (i.e. the additional damages avoided outweigh the costs), then it may have been preferable to choose this more costly option. In such instances, the Incremental Benefit : Cost ratio was used as a tool to guide the decision making process.
Although this economic appraisal process provides a robust and objective assessment of economic returns for various options, it does not necessarily mean the economically best option can or will be implemented. The required funding to pay for the schemes must still be found (see Funding chapter on page 156).
Sometimes wider objectives can also mean alternative options are delivered.

For further details on the economic appraisal, refer to Appendix F: Economic Appraisal

Cowes Esplanade

strategy

Overview

Strategy summary

Overview

A rigorous option appraisal process has ensured that the preferred options recommended are technically robust, economically sound and environmentally sustainable. However, a number of the preferred options will require funding contributions and more information is provided on page 156. For an overview of the preferred options for each Strategic Management Zone (SMZ) see Chapters 5-10. A map showing the units used is shown overleaf on page 51.

Phasing works over time based on risk

Tidal flood, coastal erosion and landslide risks are expected to develop / increase over time along the Strategy frontage.
The preferred options of the Strategy have therefore been phased in time to address the risks as they develop depending on risk triggers and the economic case to implement schemes.

Prioritising schemes

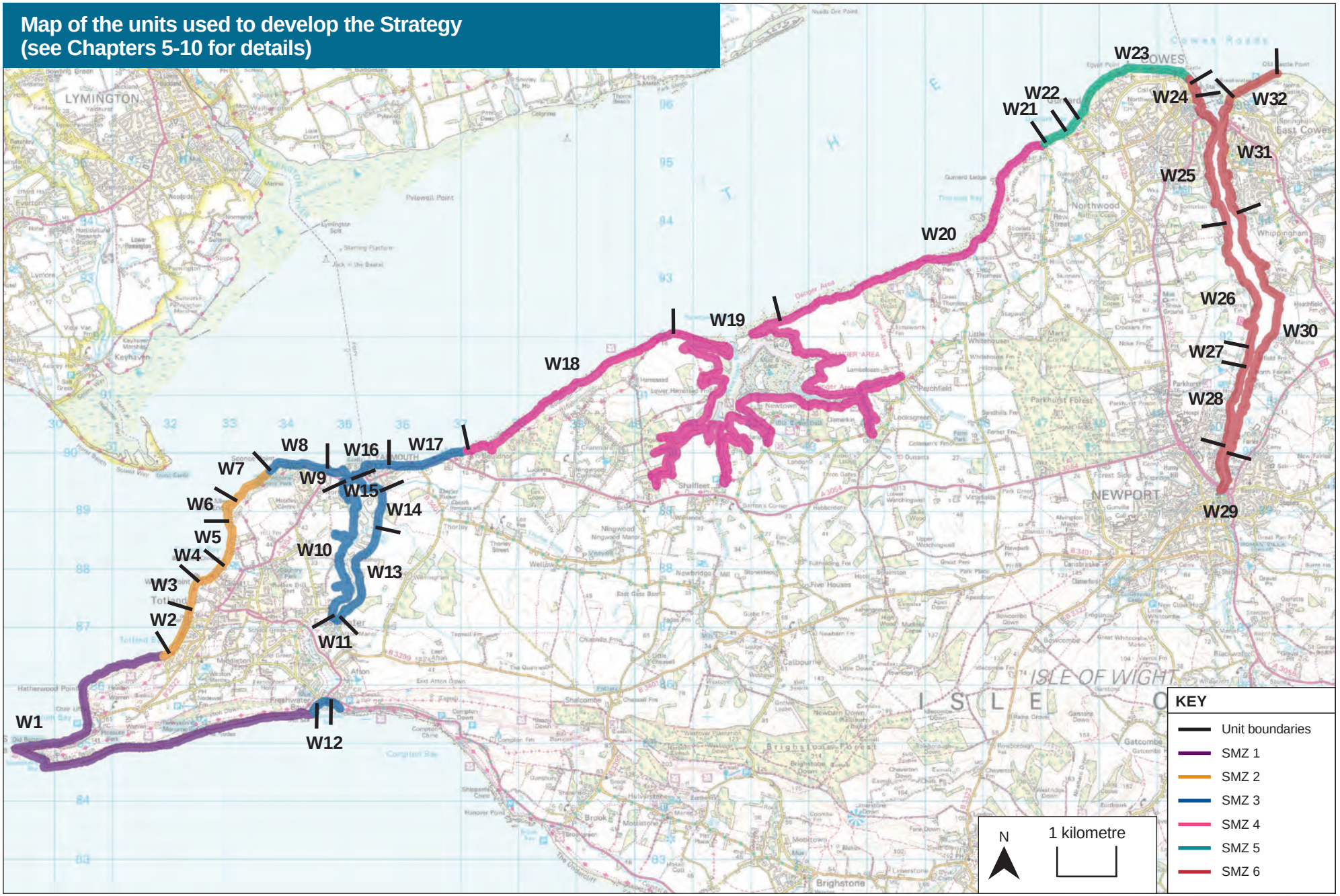
The Strategy has assessed whether the Isle of Wight communities in this area would be eligible for national government funding to replace or upgrade their coastal defences in the future. The intention is to protect as many people and properties as possible, as stated within the objectives (see page 12). However, with limited government Grant in Aid (GiA) funding available, a lack of significant external funding contributions currently identified, and the general budgetary constraints faced by Local Authorities, investment in coastal defences, particularly in the short term, has to be **carefully prioritised.** The Strategy presents the preferred options for managing the flood and erosion risks based on what is needed, but being realistic in terms of what is likely to be both deliverable and affordable.

There are a number of priority areas within the West Wight Strategy area where the standard of protection offered by the existing defences is low and there is current and significant risk from tidal flood risk and/ or erosion. Maintenance plays and important role in extending the life of the current structures. Then, over time (due to sea level rise and ageing defences) the risks are set to increase, leading to a period where important but difficult management choices will need to be made. This can include focusing limited resources on the locations where most people and property are at risk. Another distinctive feature of the Island is coastal roads at risk, some of which provide access not only to properties in the immediate vicinity, but also to much wider communities beyond. There are many competing priorities on the Isle of Wight, where the coast is so important.

The priority schemes to reduce the immediate flood risk are focussed in Cowes, East Cowes and Yarmouth where the majority of people, properties and assets are at risk. Here the existing defences are relatively low and there is significant tidal flood risk in certain areas from the present time. In the absence of available GiA funding for a more permanent scheme, temporary flood barriers and property level protection have been recommended to reduce the risks and impacts of tidal flooding. This approach provides time to generate the required funds for a more substantial scheme or to consider alternative community adaptation plans. The priority capital schemes are presented in more detail in Chapter 11. Two future coastal schemes are also identified in the Strategy, firstly to sustain the Yarmouth-Bouldnor road and communities, and secondly to minimise erosion and landslide reactivation potential in Cowes-Gurnard.

In other areas, the phased approach provides a mechanism for allowing for adaptation and changing responses to risks.
For example at Totland there is currently no significant GiA or private funding available to maintain or rebuild the sea wall or install cliff drainage systems. The short term management proposed is therefore to maximise the life of the existing defence (with the limited maintenance funding available) and to maintain coastal access for as long as possible. However, there is the realisation that without significant private contributions, in the near future the funds required

Map of the units used to develop the Strategy (see Chapters 5-10 for details)



to replace the defences are not available. A longer term plan which is focused on adaption and even relocation, supported by the planning process and a Coastal Change Management Area Plan, will need to be implemented.

The Strategy also identifies several areas (for example Gurnard Luck and Freshwater) where community led local level flood resistance and resilience measures, such as property level protection, could be implemented to address local flood risk issues.

As sea levels rise in the future, and existing defences reach the end of their life, new coastal defences will be required where the benefits and outcomes justify investment. Not all areas defended in the past can be defended in the future. The Strategy recommends a phased programme of future works, based on when risks materialise and the benefits being delivered. Given issues of affordability, delivering flood defences through a partnership approach to funding will be essential. This needs to be built into the Isle of Wight Council planning processes, and into the thinking of those in areas at risk.

A key benefit of phasing future works and management is that it provides flexibility and scope to adapt the approaches. The Strategy is currently using best estimates for future sea level rise, however there is uncertainty over exactly how this will occur in the future. Should sea levels rise slower than currently anticipated, it may be prudent, and economically beneficial, to wait longer before implementing defences in some areas. Conversely, should sea levels rise faster, it will be necessary to bring defence implementation forward, or build future schemes higher etc. This phased approach allows time to monitor sea level rise, secure funding for future schemes and ensure maximum benefits are generated by schemes. It also avoids implementing works now which we could potentially 'regret' because they are not needed. As a result of the Strategy there is the evidence and data required to make informed decisions over the location and timing of future schemes; this knowledge allows us to be prepared but flexible in going forward.

Links with the planning process and redevelopment

In the larger urban areas such as West Cowes, East Cowes, Newport and Yarmouth, redevelopment and regeneration will need to play an integral role in delivering sustainable longer term flood risk management and ensure the continued prosperity of these areas.

Through the Isle of Wight Council planning policy, future development should implement raised ground levels or provide new defences to protect the development area from future flooding or erosion. By incorporating these new defences into wider defence schemes it will help reduce the current funding gap between what is needed, and what can currently be afforded from GiA and ensure broader outcomes are delivered.

The planning process will also be an essential supporting mechanism to deliver options such as adaptation and risk reduction in proposed Coastal Change Management Areas such as Totland, Colwell and Gurnard Luck. Inappropriate development in risk areas should be avoided to ensure that additional assets or populations are not placed at risk of future erosion or flooding. There may also be opportunities for appropriate or time-limited land uses in such areas.

Environmental impacts summary

General

A Strategic Environment Appraisal was undertaken during the selection of the preferred options to help ensure that the Strategy is environmentally robust and sustainable (see Appendix G). To make sure the Strategy complies with environmental legislation further assessments were undertaken, including a Habitats Regulations

View across Newtown Estuary

Assessment (Appendix H) and a Water Framework Directive Assessment (Appendix I).

The environmental impacts of the Strategy vary across the West Wight region, depending on the preferred options being recommended. In many areas the Strategy will result in improved management and reduction of flood and erosion risk resulting in benefits particularly for human health, heritage assets and material assets in areas such as Cowes and Yarmouth. There are other areas where residual risks remain and there is the potential for adverse impacts on these receptors and these will require responses to mitigate and manage these impacts going forward.

The Strategy provides many positive impacts for the environment. In areas where natural process will be allowed to continue there will be benefits for receptors such as landscape and biodiversity. There are several large rural and environmentally designated areas of the frontage (such as around the Needles, the Western Yar Estuary, the northwest shoreline and Newtown Estuary, and the central Medina) where the preferred option is to allow natural processes to continue under a 'Do Nothing' option. This will ensure the natural evolution of these important interest features and the landscape in these areas.

In areas where defences will be maintained or implemented there is the potential for adverse minor impacts for biodiversity associated with construction works or loss of habitat from physical barriers and some mitigation such as sympathetic timing of works and methods will be required.

Environmental designations and habitats

The preferred options for many of the international and national environmentally designated areas are to 'Do Nothing' and this will allow natural processes to continue and the coastline to evolve.

There will be adverse impacts in terms of habitat loss resulting from defending parts of the frontage. Rising sea levels will lead to coastal squeeze and the potential habitat losses have been estimated by the SMP2 and accounted for by Regional Habitat Creation Programme. The implementation of the Strategy will not add to this loss.

In line with the SMP2 policy, from 2025 the Strategy also promotes the creation of new coastal habitats through Managed Realignment at Thorley Brook. This could potentially provide 31 Ha of intertidal habitat to offset coastal squeeze losses resulting from 'Holding the Line' to protect people and property in other areas of West Wight. However the grazing marsh habitat which is currently well established at this location would need to be re-created elsewhere as compensation.

Additional opportunities to explore for future habitat creation (such as near the causeway at Freshwater) have been signposted, and detailed studies looking into these areas will be required in the future.

Water quality

Overall the strategy is unlikely to have significant adverse effects on the coastal waterbodies present, as the works are generally within, or landwards of existing defence footprints. There is the potential for some adverse impacts in certain units, however, these local impacts, when considered within the context of the wider waterbodies, are unlikely to prevent the achievement of good ecological potential and specific objectives for the waterbodies as a whole.

It is noted that there may be localised and temporary water quality impacts as a result of maintenance/construction of defences, although this will be minimal and unlikely to cause a permanent changes in the ecological potential of the waterbodies.

Totland Bay

View of the Needles and Alum Bay

SMZ 1

Needles Headland

Fort Redoubt to southern limit of Totland Bay

SMZ 1

Needles Headland

Strategy Management Zone 1 (SMZ 1) is located between Fort Redoubt, adjacent to Freshwater Bay, and the southern limit of Totland Bay, spanning around the Needles headland.

Shoreline Management Policy (2011): The policy for SMZ 1 is 'No Active Intervention'. This policy promotes no planned investment in defending against flooding or erosion, whether or not a coastal defence has existed previously.

Land Use: Mainly open space utilised for leisure and agriculture; there are heritage attractions associated with the Needles and a coastal footpath.

Coastal Processes: This frontage is characterised by steep to vertical Chalk or sandstone cliffs and some shingle beaches. Rockfalls and landslides occur, with partially active scarps on the coastal slopes at Headon Warren. The cliff toe is prone to erosion. The exposed headland is subject to large waves in comparison to other more sheltered locations in the study area.

Environment: This area includes the iconic landscapes of the Needles, including the Needles Battery Site Scheduled Monuments on the Chalk headland and the adjacent Alum Bay coloured sands. Other Scheduled Monuments in the area include the Tennyson Down Mortuary enclosure and Bronze Age round barrows. This historic landscape is also covered by a number of important environmental designations and is a Special Protection Area, Site of Special Scientific Interest, Area of Outstanding Natural Beauty and part of the heritage coastline.

Coastal Defences: There are no formalised coastal defences in this strategic zone.

Flood and Erosion Risk: The risk of flooding is negligible in this location owing to the steep topography. Although the coastline is undefended and eroding, due to the small number of assets the risks from erosion are relatively low and localised.

Wider Stakeholder Aspirations: Maintain coastal access (coastal footpaths) and the natural environment, the eroding cliffs are a tourist attraction.

Baseline – what would happen if we did nothing?
Under a 'No Active Intervention' scenario there would continue to be no risk of flooding. The erosion risk will increase over the next 100 years, with the majority of properties being eroded in the last 50 years.

By 2055 there would be a total of 7 properties at risk of erosion, by 2115 a total of 35 properties would be at risk from erosion.

Properties at risk from flooding▾	Time Horizons 2015	2025	2055	2115
Residential	0	0	0	0
Commercial	0	0	0	0
Total	**0**	**0**	**0**	**0**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

There are no properties at risk of flooding in this strategic management zone.

Properties at risk from erosion▾	Time Horizons 2015	2025	2055	2115
Residental & Commercial	0	1	7	35

Properties at risk of erosion.

By 2115 the total damages in SMZ 1 would be expected to reach £1.7million.

The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

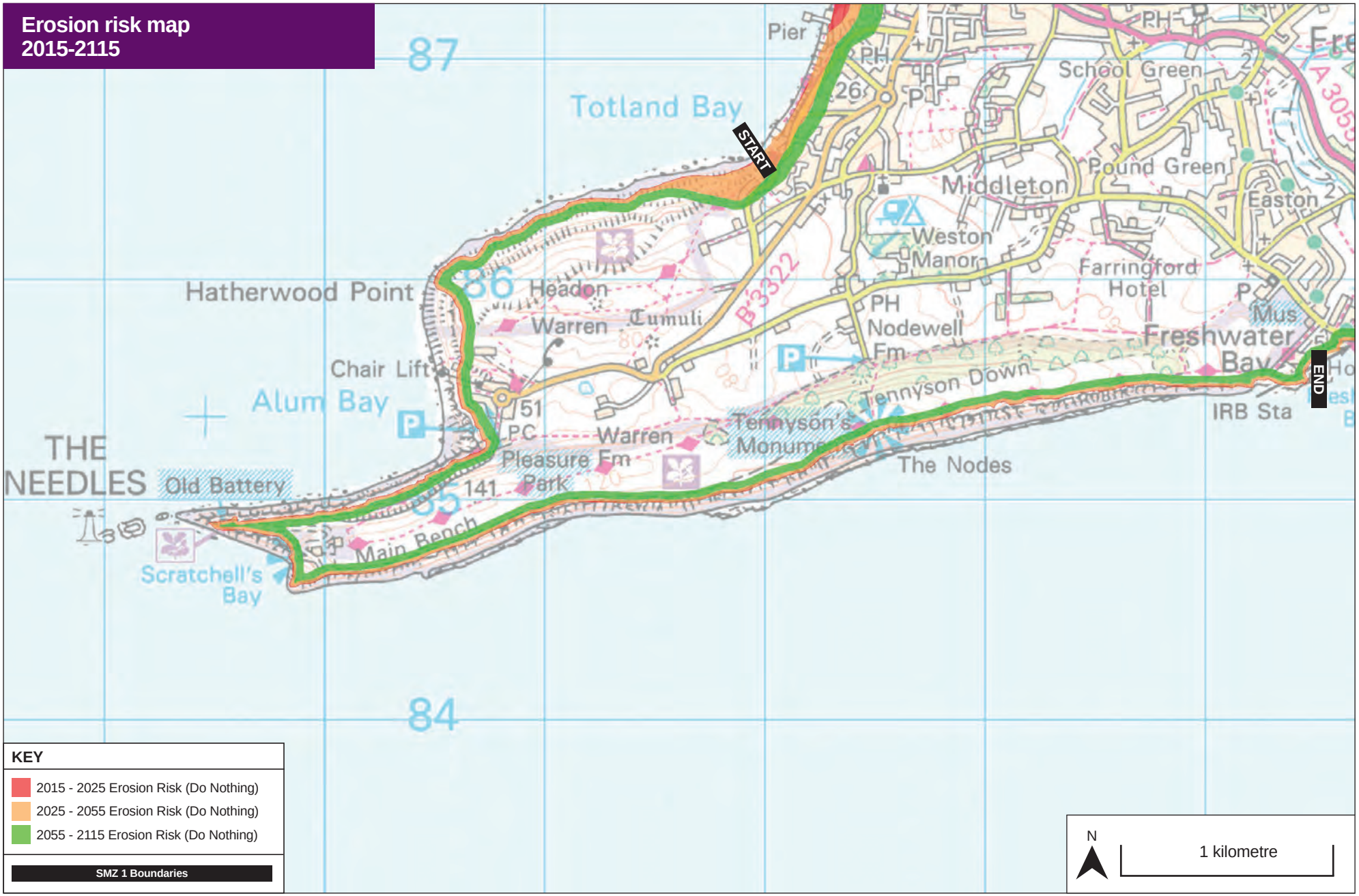
Type of damage	PV cost of damage*
Direct flood damages	£0.0M
Direct erosion damages	£1.7M
Indirect damages (e.g. health)	£0.0M
Total	**£1.7M**

SMZ 1 whole life (100 year) do nothing damages (present value - £M)

Alum Bay chairlift

View across Freshwater Bay

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

Given that this zone has no flood risk and only localised erosion risk to property, is largely undefended, and is valued for its natural beauty and environmental importance, **the preferred strategic approach is to work with nature as much as possible to maintain and enhance the landscape and environment.** The Isle of Wight Council will not repair or maintain existing defences, and no new defences will be permitted where they are not already present.

However, it is recognised that local erosion risks to businesses, people and coastal footpaths will need to be mitigated or adapted to, and therefore privately funded maintenance of existing coastal infrastructure or defences will be permitted (subject to gaining the necessary consents).

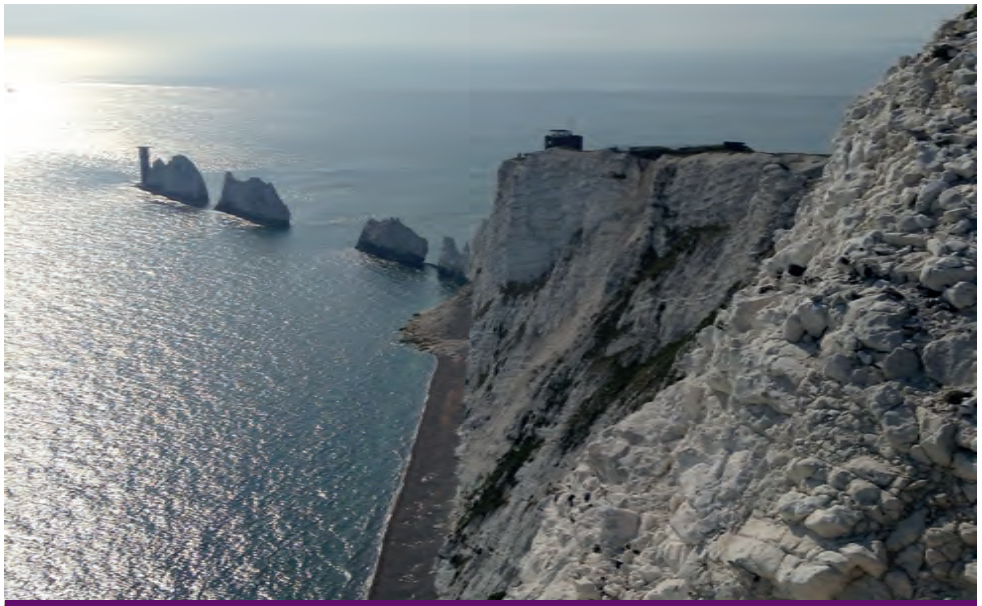
The Needles Old Battery site is a key heritage feature within this zone (together with the nearby sites of the Needles New Battery and High Down Rocket Testing Site) and there is a recognition that this asset may be at threat of erosion in the longer term and localised adaptation or mitigation may be required.

The preferred option will ensure that the natural landscape of the Heritage Coast, which draws in many visitors, is allowed to evolve in a largely unspoilt manner. The erosion of the chalky and sandy cliffs will also provide an additional benefit through the continued supply of sediment which is important for nourishing the adjacent beaches of the adjacent Totland and Colwell Bays.

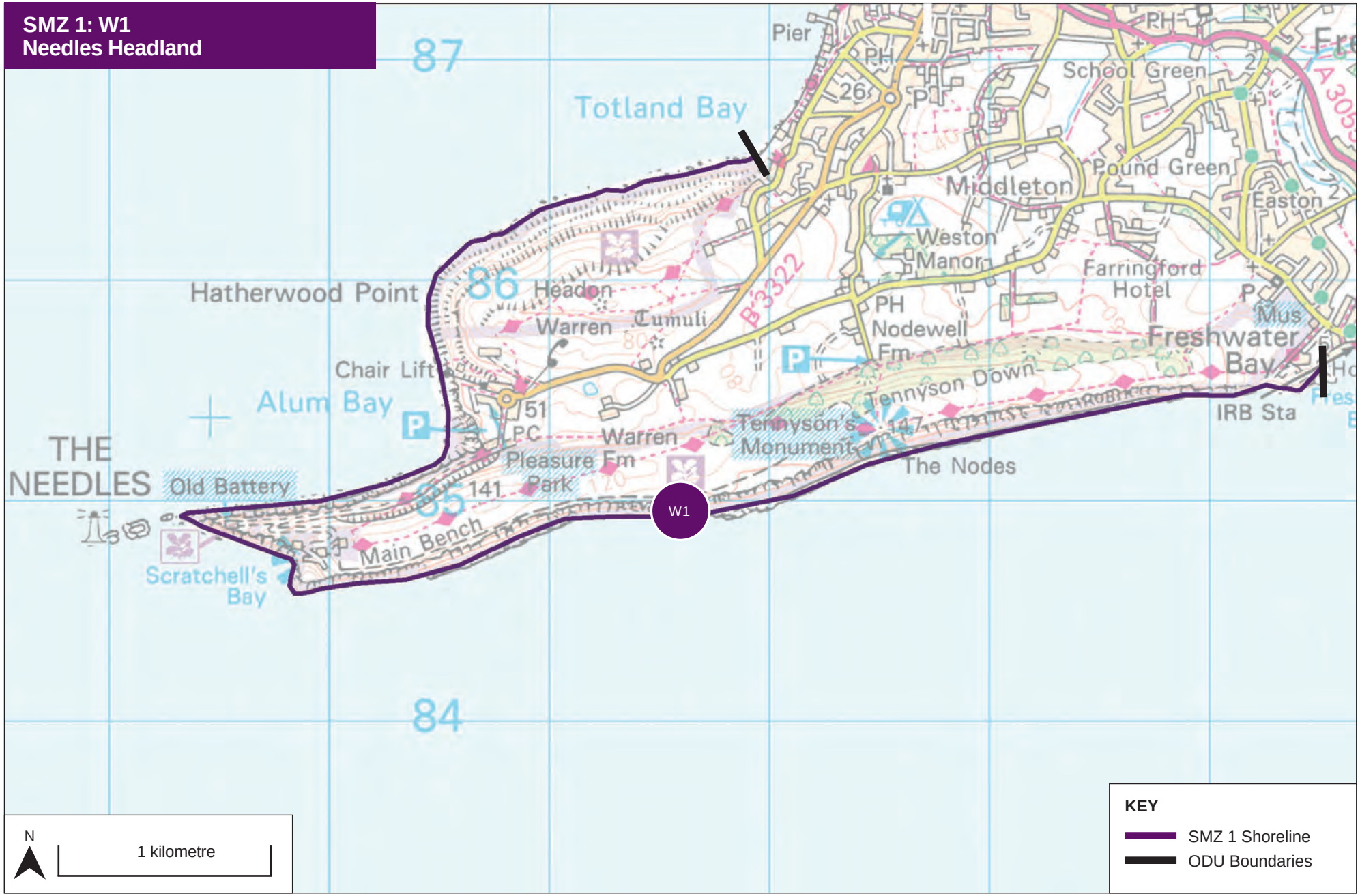
The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal

The coloured sands of Alum bay make a popular visitor attraction



View over the iconic Needles and lighthouse



Option Development Unit W1 boundaries in SMZ1

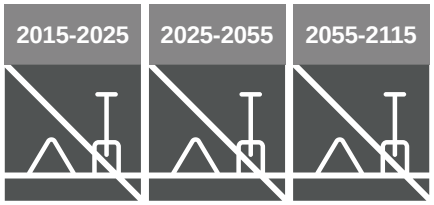
SMZ 1 Preferred Strategic Option: Allow natural processes to continue, with privately funded maintenance of existing assets permitted (subject to gaining the necessary consents).

PV Cost*	PV Benefits*	Benefit:Cost ratio
£0	£0	N/A

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W1 Needles Headland



Allow natural processes to continue, with privately funded maintenance of existing assets permitted (subject to gaining the necessary consents). No new defences permitted in currently undefended areas. Health and Safety obligations relating to eroding coastline to be met.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

High tide at Colwell Bay

SMZ 2

Totland and Colwell Bays

Southern limit of Totland Bay to Fort Victoria

SMZ 2

Totland and Colwell Bays

Strategy Management Zone 2 (SMZ 2) encompasses Totland and Colwell bays. As well as the settlements of Totland and Colwell, Fort Albert and Fort Victoria Country Park are also included in this zone.

Shoreline Management Policy (2011): There are a mixture of SMP policies in this zone. In the south, from the southern limit of Totland to southern Colwell Bay, the 2011 SMP policy was to 'Hold the Line'. This policy promoted the maintenance and strengthening of the existing defences to reduce erosion risks. Previously, this was marginally feasible, however since the SMP was published, risks have increased, and this approach is discussed further in this chapter. Moving north, the undefended frontages in central Colwell Bay and near Fort Victoria have a policy of 'No Active Intervention', supporting natural evolution of the coast and no planned investment in preventing erosion. Fort Albert has a 'Hold the Line' policy until 2055 and then changes to 'No Active Intervention'.

Land Use: Totland and Colwell are characterised by residential housing interspersed with commercial property and are mainly urban areas. The remainder of the zone is more sparsely populated with some leisure businesses such as Linstone Chine Holiday Village, Fort Albert and Fort Victoria Country Park. A number of beaches and seawalls are used for amenity use; the area is popular for walking.

Coastal Processes: The cliffed coastline is subject to erosion and landsliding, as evidenced by the significant landslide at Totland in 2012, which resulted in the failure of the sea wall. The coastline is less exposed to wave action compared to SMZ 1 but not as sheltered as the north of the island. There a number of sand and shingle beaches present that front the cliffs.

Environment: This SMZ comprises a number of national nature designations including a Site of Special Scientific Interest and Site of Importance for Nature Conservation; there is also a Conservation Area in Totland. The Heritage asset of Fort Albert (Grade II* Listed Building) is within this frontage.

Coastal Defences: The majority of the frontage is defended with there being undefended sections in central Colwell Bay and around Fort Victoria Country Park. There a variety of structures to mitigate erosion including seawalls (mostly concrete, with sheet piling sometimes present), rock revetments and timber and rock groynes. Generally, the condition and residual life of the defences is fair to good, but there are locations where the condition has deteriorated to a poor status, for example, parts of the wall around Fort Albert and the failed section at Totland.

Flood and Erosion Risk: In the same way as SMZ1, the risk of flooding is negligible owing to the predominantly cliffed coastline. There is a significant erosion risk in this landsliding area and this part of the frontage has relatively large future erosion predictions over the duration of the Strategy.

Wider stakeholder aspirations: Maintain coastal access, the seawall is a popular walking and access route around this part of the coast for residents and visitors. The access restrictions caused by the Totland landslide highlighted this as a key issue.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario there would continue to be no risk of flooding. The erosion risk will increase over the next 100 years, with the majority of properties being eroded in the last 50 years.

By 2055 there would be a total of 86 properties at risk of erosion, by 2115 a total of 394 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	0	0	0	0
Commercial	0	0	0	0
Total	**0**	**0**	**0**	**0**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

There are no properties at risk of flooding in this strategic management zone.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2025**	**2055**	**2115**
Residental & Commercial	0	4	86	394

Properties at risk of erosion.

By 2115 the total damages in SMZ 2 would be expected to reach over £13million.

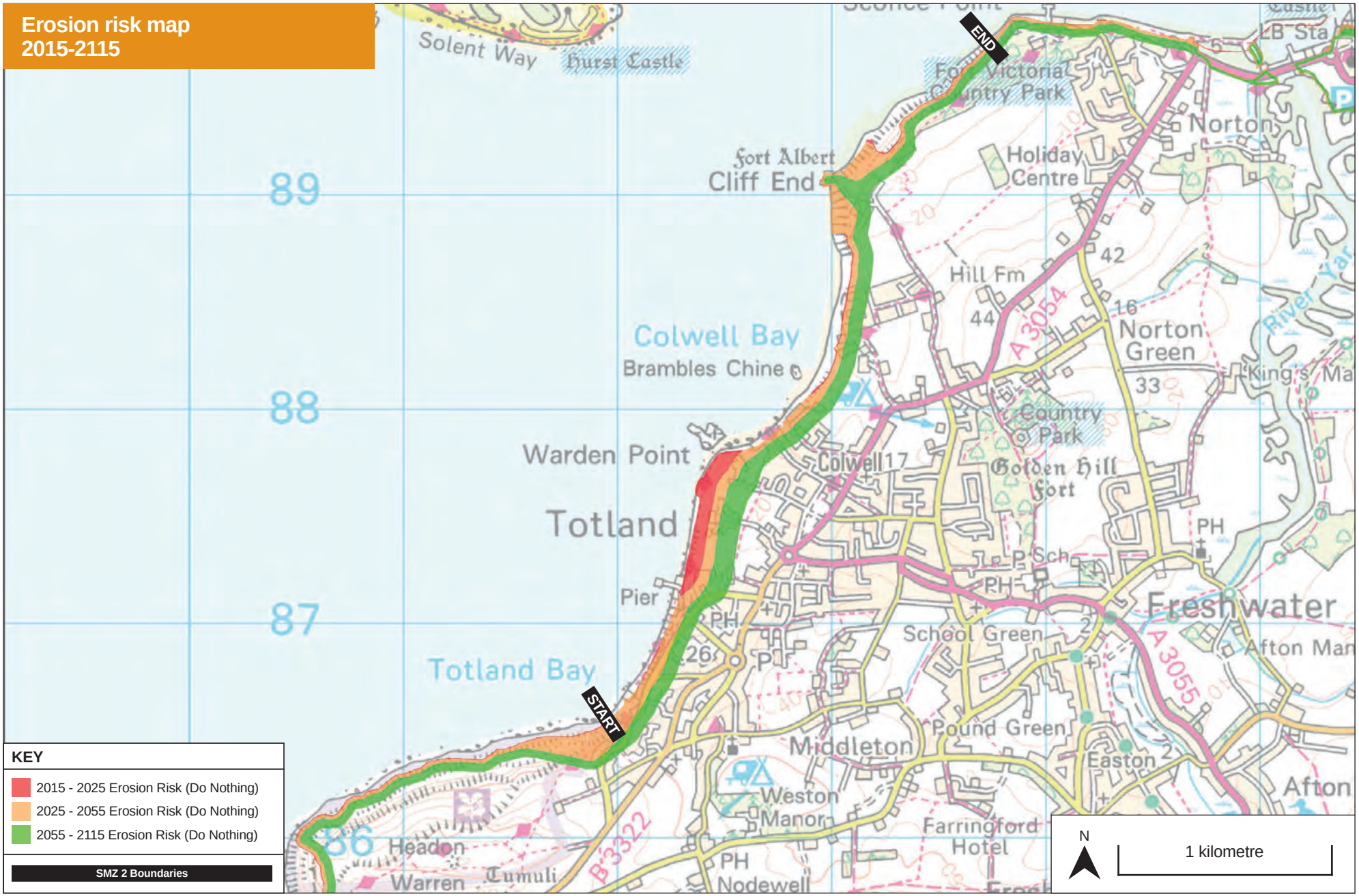
The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£0.0M
Direct erosion damages	£11.9M
Indirect damages (e.g. recreation)	£1.3M
Total	**£13.2M**

SMZ 2 whole life (100 year) do nothing damages (present value - £M)

Coastal access severed due to the landslide at Totland in 2012

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

The preferred strategic management approach in this zone is constrained by affordability and the lack of available funding.
The preferred approach is therefore to maintain coastal access as long as possible and ensure health and safety compliance.
A Coastal Change Management Area Plan will be developed by the Isle of Wight Council and future adaptation will be supported by planning policy.

There is erosion risk to a significant number of properties in the longer term and there is a strong local aspiration to protect the current seawall assets. As a result options to maintain, upgrade or improve the seawall have been explored within each section of the bays as part of this Strategy and the costs assessed in relation to the benefits these options would deliver.

A key failure mechanism for landslips in this area relates to the impact of groundwater on the weak cliffs, and not necessarily due to coastal processes alone. There is no certainty that new coastal defences or ongoing large scale maintenance of the present defences would prevent cliff failure. An even more costly scheme involving slope stabilisation works would be required.

The assessment has demonstrated that the economic case for replacement defences coupled with a cliff stabilisation scheme (to ODUs W2 – W4) is not economically viable (i.e. the costs, approximately £25 million in PV* terms, significantly exceed the benefits at the present time, especially as the majority of properties are set back from the cliff top and not at risk until the longer term. There is therefore very little likelihood of any significant Grant in Aid funding to help pay for such an option, or that the very large contribution therefore required from other sources is forthcoming.

In Totland and Colwell Bay, the short-term management proposed is therefore to maximise the life of the existing defences (with the limited maintenance funding available) and to maintain coastal access for as long as possible. The preferred option recognises the importance to the community of the sea wall and associated coastal access; the local importance of which has been further highlighted by the large landslip which occurred in December 2012 to the north of the old pier at Totland. Stakeholder desires and the recreational benefits of maintaining access along the frontage have therefore shaped the short term preferred option for the frontage. Work to restore the footpath over the recent landslip has occurred. It is highly likely that further slips will occur over time and minor or major works to re-instate access will be required. Larger-scale works will be judged on a case-by-case basis, and in the longer term maintaining access may not be sustainable as the defences deteriorate further or as more slips occur. There is the realisation that without significant private contributions, in the future the funds required to replace the defences are not available.

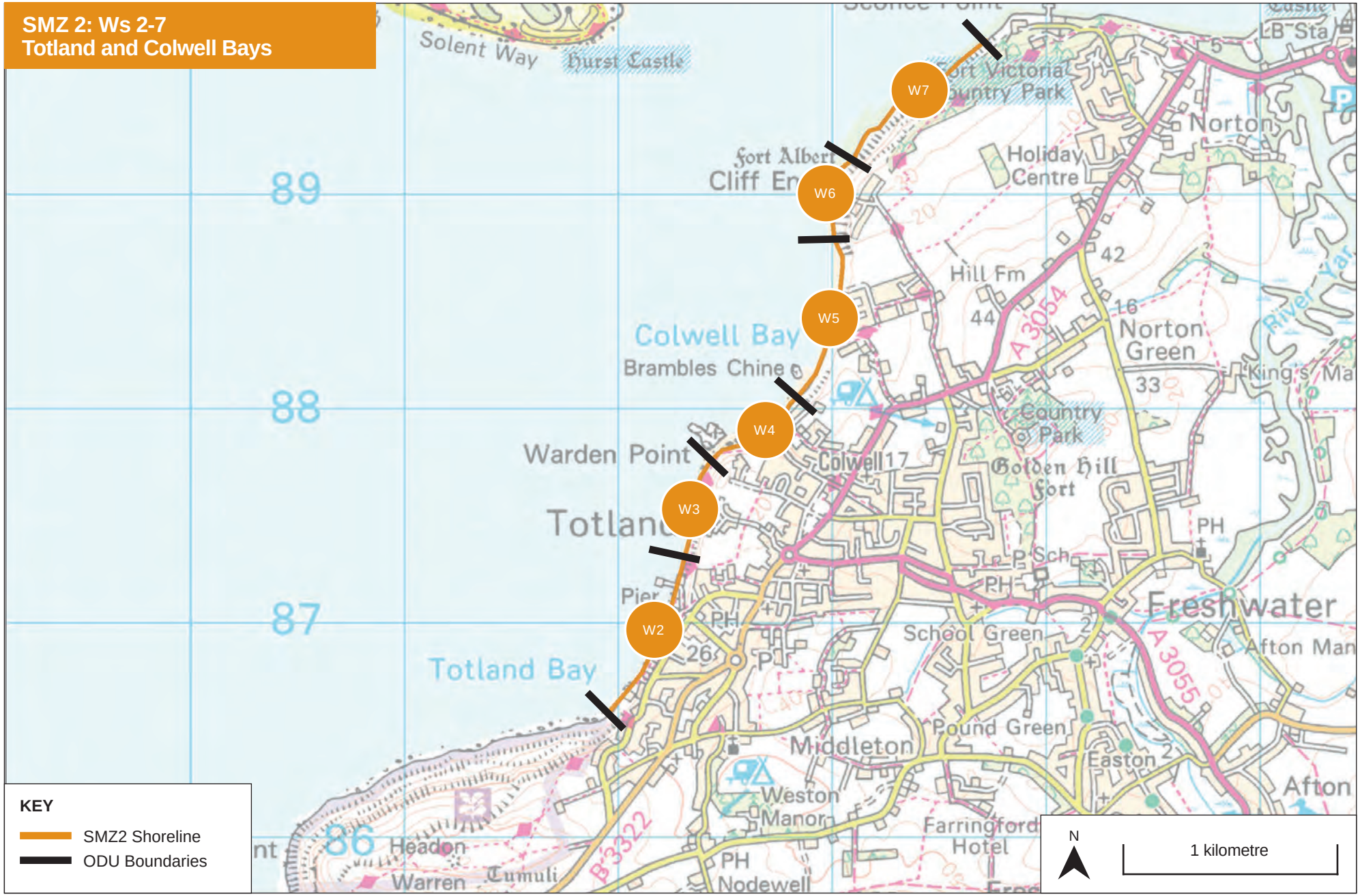
The Present Value (PV) cost of the preferred strategic option in SMZ 2 is approximately £0.31million (approximately £0.92million in cash terms). The Isle of Wight Council will continue explore potential funding options and if sufficient contributions can be sourced, alternative options to better reduce the risks posed by erosion and landsliding could be implemented. If funding is not forthcoming a Coastal Change Management Area Plan will be developed and implemented to ensure future development is appropriate within the potential landslip risk zones, and this will also provide support to help communities adapt or relocate if there is no alternative.

Privately funded maintenance of existing private defences is permitted (subject to gaining the necessary consents).

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.



ODU W 2-7 boundaries in SMZ 2

SMZ 2 Preferred Strategic Option: Maintain coastal access as long as possible and ensure health and safety compliance. Develop Coastal Change Management Area Plan and adaptation to be supported by the planning process.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£308,000	£931,000	3.0 : 1

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W2-4 & 6 Totland and Colwell Bays

Maintain coastal access for as long as possible (and ensure health and safety compliance) by maximising the life of the existing defences within the limited maintenance funding available. Privately funded maintenance of existing private assets will be permitted (subject to gaining the necessary consents).

Further landslips are likely to occur over time and any future larger-scale repairs required will be assessed on a case-by-case basis.

Upgrade or replacement of defences is not planned, due to a lack of currently available funding. A Coastal Change Management Area Plan will therefore be developed and adaptation supported by the planning process.

W5 & W7 Central Colwell Bay and Fort Victoria Country Park

Allow natural evolution of the coast to continue. Ensure health and safety compliance.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

View looking South over Yarmouth and Western Yar Valley

SMZ 3

Yarmouth and the Western Yar

Yarmouth coast (Fort Victoria to Port la Salle) and the Western Yar valley (including Freshwater Bay)

SMZ 3a

Yarmouth coast

Strategy Management Zone 3a (SMZ 3a) stretches between Fort Victoria and Port la Salle, and includes Yarmouth town and Norton Spit (as far south as, but not including, Thorley Brook).

Shoreline Management Policy (2011): The policy in this strategic zone is mostly 'Hold the Line'. This policy promotes the maintenance of existing defences and implementation of new defences to manage flooding and erosion risks. The only area that differs from this is the short frontage from Fort Victoria and Norton, which changes to a policy of 'No Active Intervention' after 2025, supporting no planned public investment in defending against flooding or erosion

Land Use: Yarmouth is a key residential and commercial town. There is a school, harbour and ferry terminal that provides an important link to the mainland. Outside of Yarmouth town itself there are other residential properties and land used for recreation. The A3054 coastal road is within this strategic zone.

Coastal Processes: The Yarmouth section of the SMZ is on the relatively sheltered, northern coast of the Island. As a result wave overtopping is less of an issue here than on the southern coast of the study area.

Environment: This SMZ comprises a large number of diverse designations relating to biodiversity, landscape and heritage. In regards to biodiversity the area is designated as a Special Protection Area, Ramsar site, Special Area of Conservation and Site of Special Scientific Interest. The area also comprises a historic conservation area, multiple listed buildings, Yarmouth Castle (Scheduled Monument) and an Area of Outstanding Natural Beauty. The seaward walls of Yarmouth Castle currently act as a sea defence and other sections of seawall in the area are historic.

Coastal Defences: Significant portions of the frontage are defended around Yarmouth, generally with ad-hoc private defence. Defence types are mixed and include steel sheet piles, concrete walls, masonry walls and rock revetments. There is also a timber breakwater sheltering the harbour. The condition of the structures is generally fair to good.

Flood and Erosion Risk: The SMZ has both flooding and erosion risks. Flooding in Yarmouth is evident today during fairly common storm events; the recent storm in February 2014 caused disruption to the ferry service and damage to properties. This risk will become much more significant over time as a result of sea level rise. A slow but ongoing erosion risk exists to the frontage and the A3054 road is at risk from both flooding and erosion.

Wider stakeholder aspirations: People from Yarmouth expressed their views in February 2015 and the issues that were highlighted included protecting and maintaining the functionality of Yarmouth Harbour, the Ferry terminal and the A3054 road, which are regarded as key infrastructure and community assets. Improved coastal flood and erosion protection is also aspired to whilst recognising the need to maintain the character of the Town. Coastal access is also important to the community.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario there would be significant flood and erosion risks over the next 100 years. Tidal flooding has already occurred in Yarmouth and the frequency of such events is expected to

increase in the future due to climate change. If defences are allowed to fail there will be an ongoing threat of erosion to assets including the A3054. As well as providing the main link between the west side of the island and Newport this road also carries utilities that support Yarmouth. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table below.

Today there are 41 properties at risk of flooding from a 1:200 year (0.5% annual chance) event, by 2115 there would be a total of 77 properties at risk from tidal flooding. By 2055 there would be a total of 45 properties at risk of erosion, by 2115 a total of 194 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	13	15	18	41
Commercial	28	33	29	36
Total	**41**	**48**	**47**	**77**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2025**	**2055**	**2115**
Residental & Commercial	0	0	45	194

Properties at risk of erosion.

By 2115 the total damages in SMZ 3a would be expected to reach £36million.

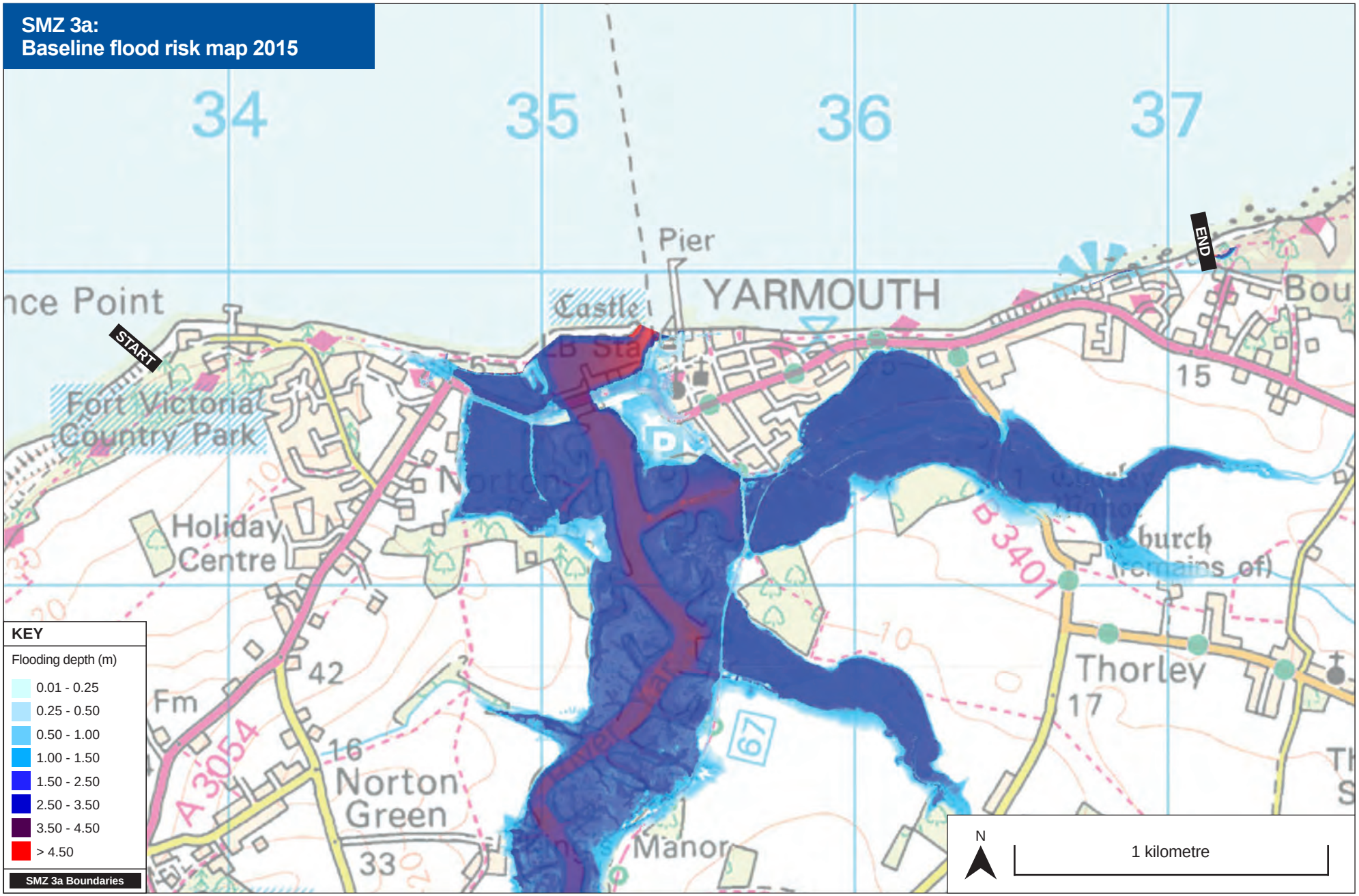
The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£3.6M
Direct erosion damages	£7.3M
Indirect damages (e.g. access)	£25.1M
Total	**£36.0M**

SMZ 3a whole life (100 year) do nothing damages (present value - £M)

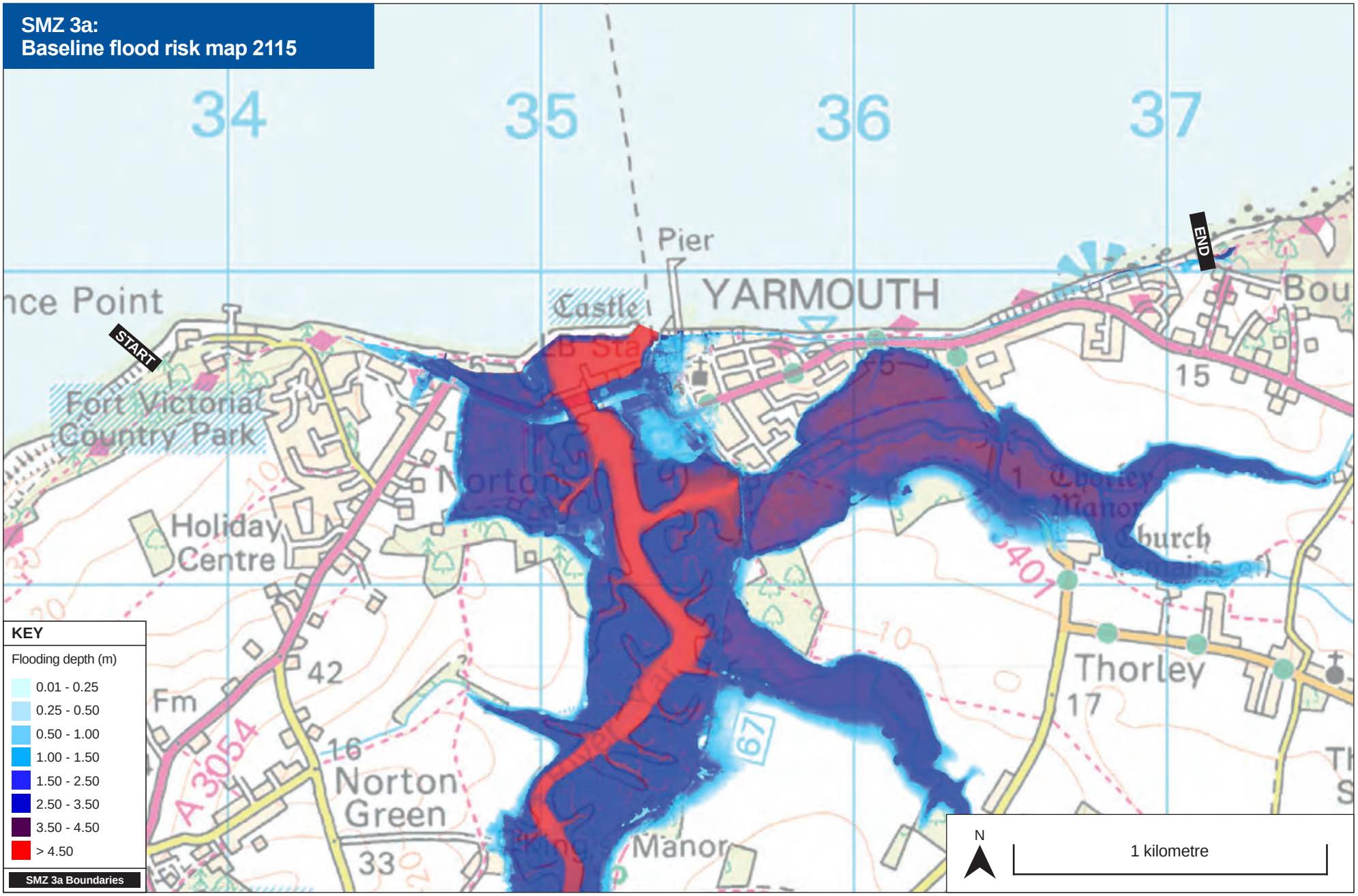
Tidal flooding in Quay Street Yarmouth (March 2008)

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.



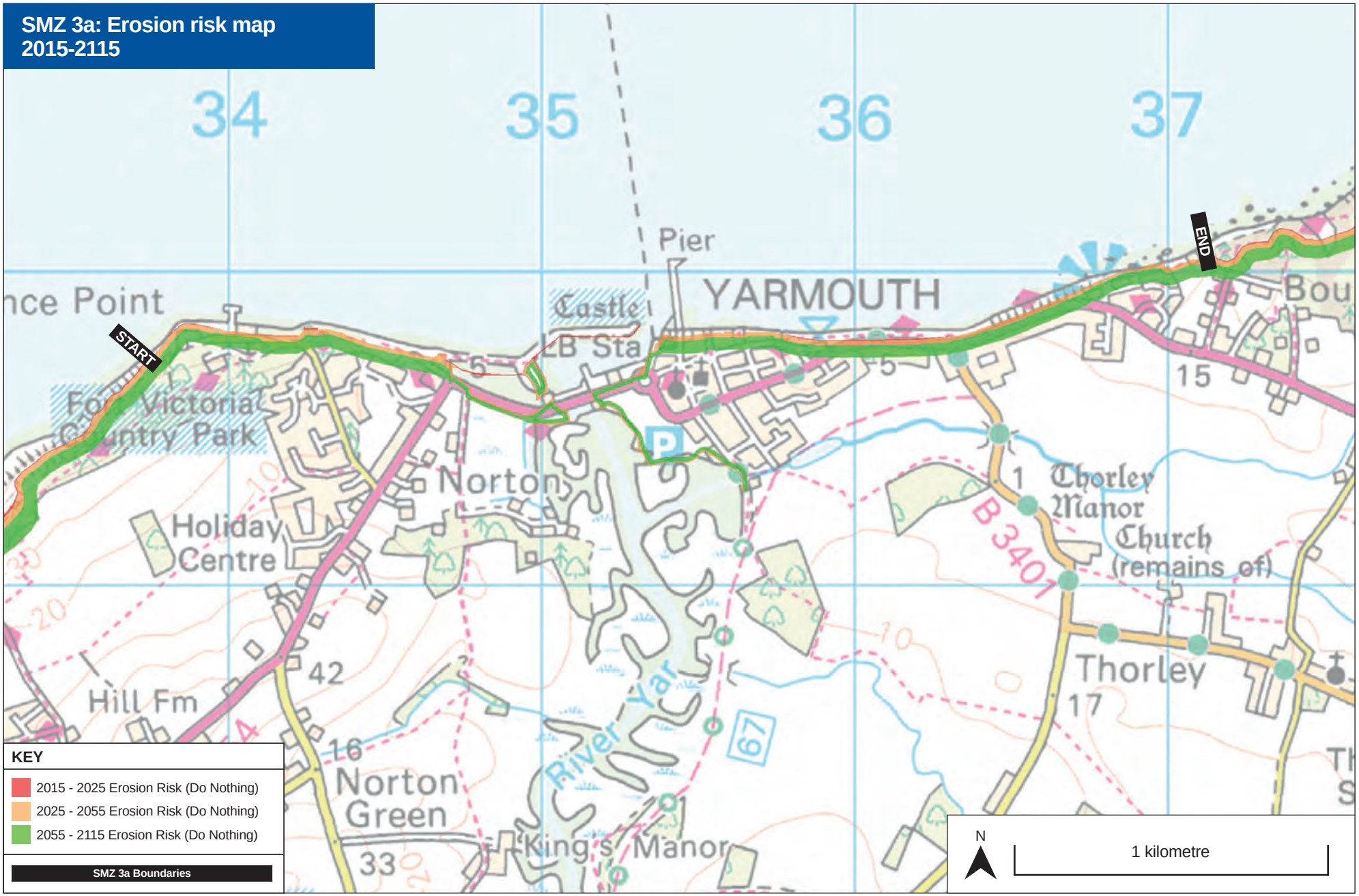
Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 3a:
Baseline flood risk map 2115



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 3a: Erosion risk map 2015-2115



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

There is significant tidal flood risk to commercial and residential properties on the western side of Yarmouth, the Ferry Terminal and around the Harbour. In the future this flood risk is expected to increase in severity and extent due to climate change and sea level rise, which will also increase the risk of erosion along the coastal frontage.

The preferred option identifies the need to reduce flood risk, but based on the latest information, the Strategy recognises that the government Grant in Aid monies available for a scheme at Yarmouth are modest. This is partly because national government funding is targeted towards reducing flood risk to residential properties, rather than to commercial properties or businesses. Despite experiencing several flood events and considerable awareness raising of the risks by the Yarmouth Coastal Defence Working Group, the significant funding and contributions that would be required to implement more ambitious schemes are currently not available.

The preferred option is to use temporary flood barriers to reduce the tidal flood risk in the short to medium term (up to 2055). There is a range of industry approved commercially available barriers which could be utilised. Typically these systems comprise of interlocking units which can be stored locally then manually deployed prior to an event by trained personnel. The units require no permanent fixing to the ground but would require ongoing maintenance and upkeep. To ensure the barriers are effective, their deployment will need to be linked to a tide event flood warning system. **Private ongoing maintenance and raising of defences, particularly along the seafront, is encouraged to prevent the risk of erosion and assist in addressing flood risk (subject to gaining the necessary consents).**

In the short to medium term the ability to secure a proportion of government Grant in Aid funding towards the temporary barriers is likely as it would reduce tidal flood risk to the areas of Yarmouth at greatest risk, although, contributions will also be required. The Isle of Wight Council will seek funding for the short term scheme. In addition, Yarmouth Harbour Commission wishes to continue to maintain and improve the existing breakwater fronting the Harbour, thus providing a contribution to reducing the tidal flood risk (by reducing wave action and overtopping). Funding from YHC is required as national government funding is targeted at reducing flood risk to residential properties, rather than to commercial properties or businesses, and Yarmouth town will remain at flood risk behind the breakwater.

The Strategy also recommends preventing erosion of the A3054 road just east of Yarmouth which is considered to be a critical highway link for the whole of the west Wight population. Additionally, under the road is a utilities/services corridor serving the town and hence protection of this link is critical. Therefore, the preferred option is short term maintenance followed by refurbishment of the sea defences in the area fronting the road. This scheme is likely to be eligible for a proportion of Grant in Aid, with some additional contributions required.

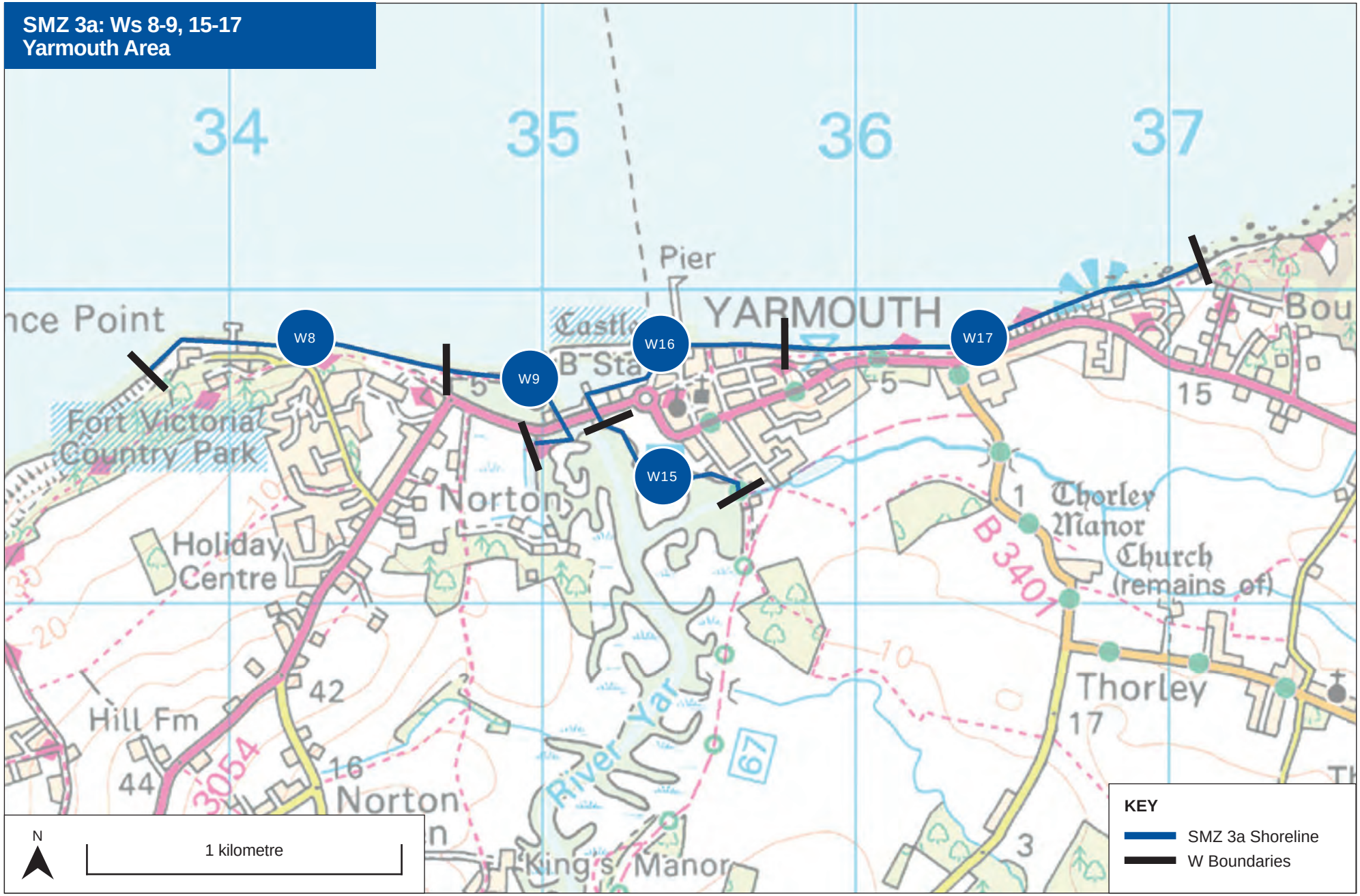
In the longer term as the risk at Yarmouth becomes greater, the preferred option is to improve protection through raising or replacing existing quay walls and coastal defences, coupled with setback bunds, floodwalls and flood gates. However, significant non Grant in Aid funding contributions will need to be secured. The Strategy proposes implementing this longer term option to ensure the continued viability of the town and reducing flood risk to people and property. The IWC and the community will continue to explore funding options.

The present value (PV) cost of the preferred options for SMZ 3a is approximately £6.6million (approximately £22.8million in cash terms).

The community should be aware that some flood risk will remain, as not all areas will benefit from the temporary barriers proposed. Preparations should therefore be made accordingly by the community. As flood risk increases in the long term the case for a more comprehensive solution may be strengthened. However, if funding for a longer term solution is not forthcoming further adaption of the community to future flood risk will be required.

For further details, refer to Appendix J: Option Development and Appraisal

Marsh behind Norton Spit, seaward of the main road



ODU W8,9,15,16 & 17 boundaries in SMZ 3a

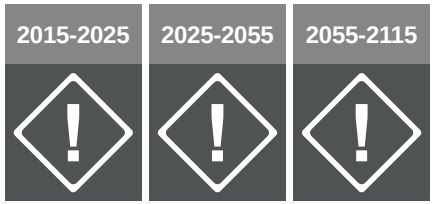
SMZ 3a Preferred Strategic Option: Use Temporary Flood Barriers to manage and reduce flooding to areas at significant risk by sustaining a 1 in 75 year Standard of Protection. Prevent erosion to critical infrastructure serving the town and the West Wight. From 2055, if funding can be secured, raise / implement new defences (bunds and floodwalls) to manage long term increase in flood and erosion risk posed by sea level rise.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£6,560,000	£31,993,000	4.9 : 1

KEY

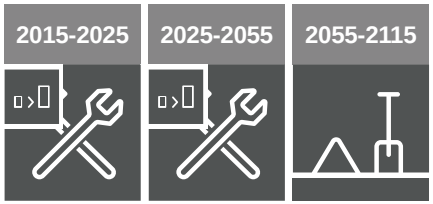
- Do Nothing
- Temporary flood barriers
- Property Level Protection
- Maintenance
- Environmental mitigation/ habitat creation
- Capital Works
- Upgrade/ Refurbishment
- Maintain access/ Health & Safety
- Adaptation / Coastal Change Management Area
- Developers provide new defences

W8 Fort Victoria and Norton



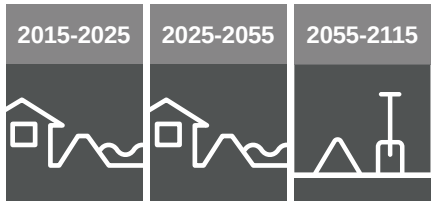
No planned publicly funded investment in coastal defences in this area, but private landowners may wish to undertake maintenance of their existing defence structures, subject to gaining the necessary consents. Ensure health and safety compliance where relevant.

W9 Norton Spit



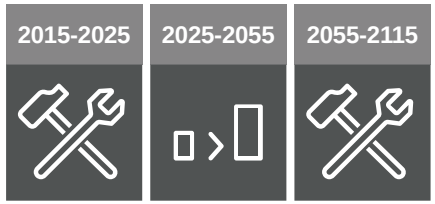
Maintain existing assets. Yarmouth Harbour Authority to maintain breakwater with refurbishment and upgrades if funding available (subject to gaining the necessary consents). Funding of maintenance and defence upgrades will need to be found from other sources other than GiA.

W15-16 Thorley Brook to Yarmouth Common



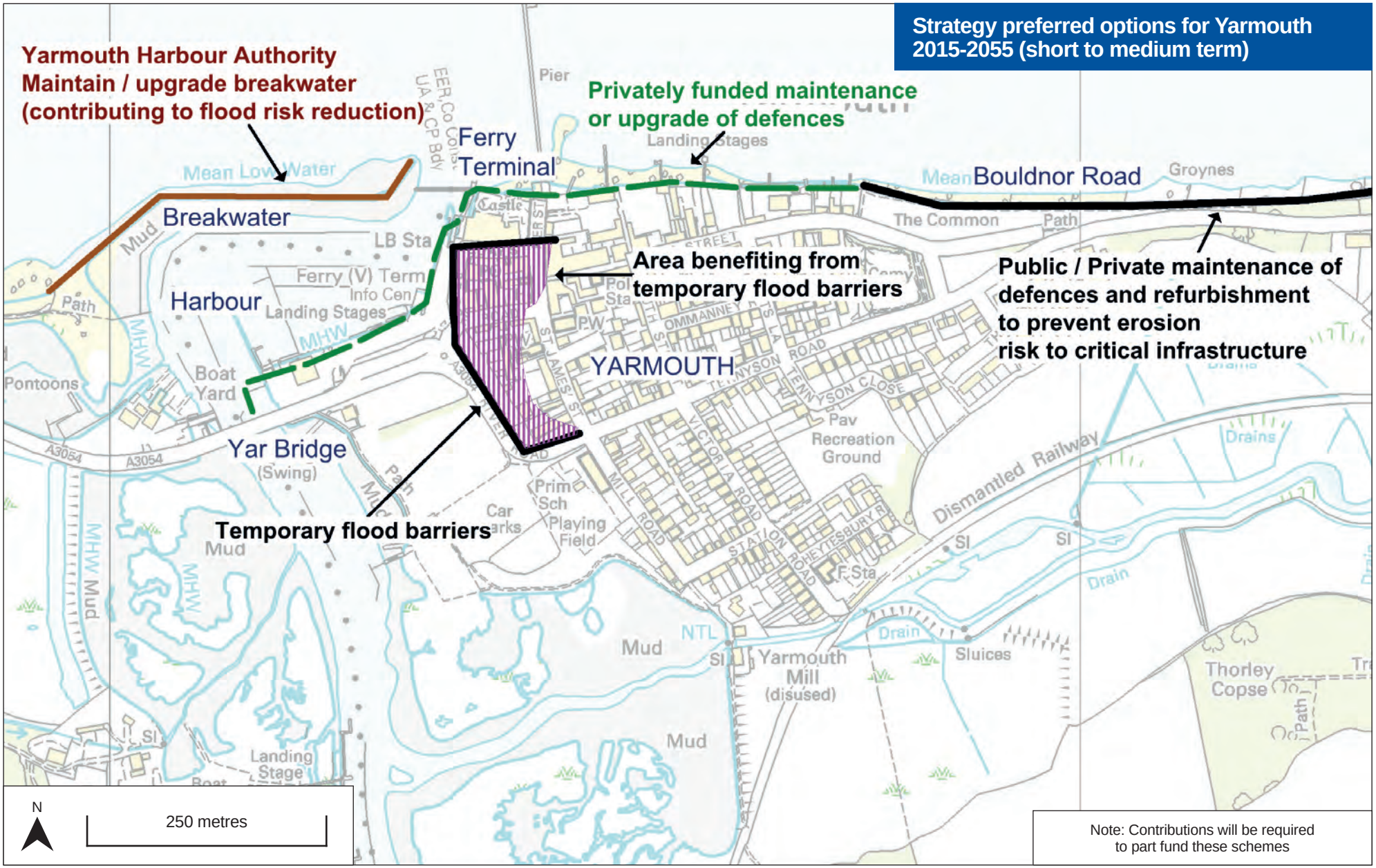
Manage and reduce flooding to areas at significant risk with temporary flood barriers in the short to medium term. GiA likely to provide some funding for temporary flood defences in the short to medium term. Continued maintenance or upgrading of private defences is encouraged (subject to gaining the necessary consents). In the long term raise or implement new defences (bunds and floodwalls) to manage long term increasing flood and erosion risk posed by sea level rise; limited GiA likely for longer term defences and other sources of funding will need to be found.

W17 Yarmouth Common to Port La Salle

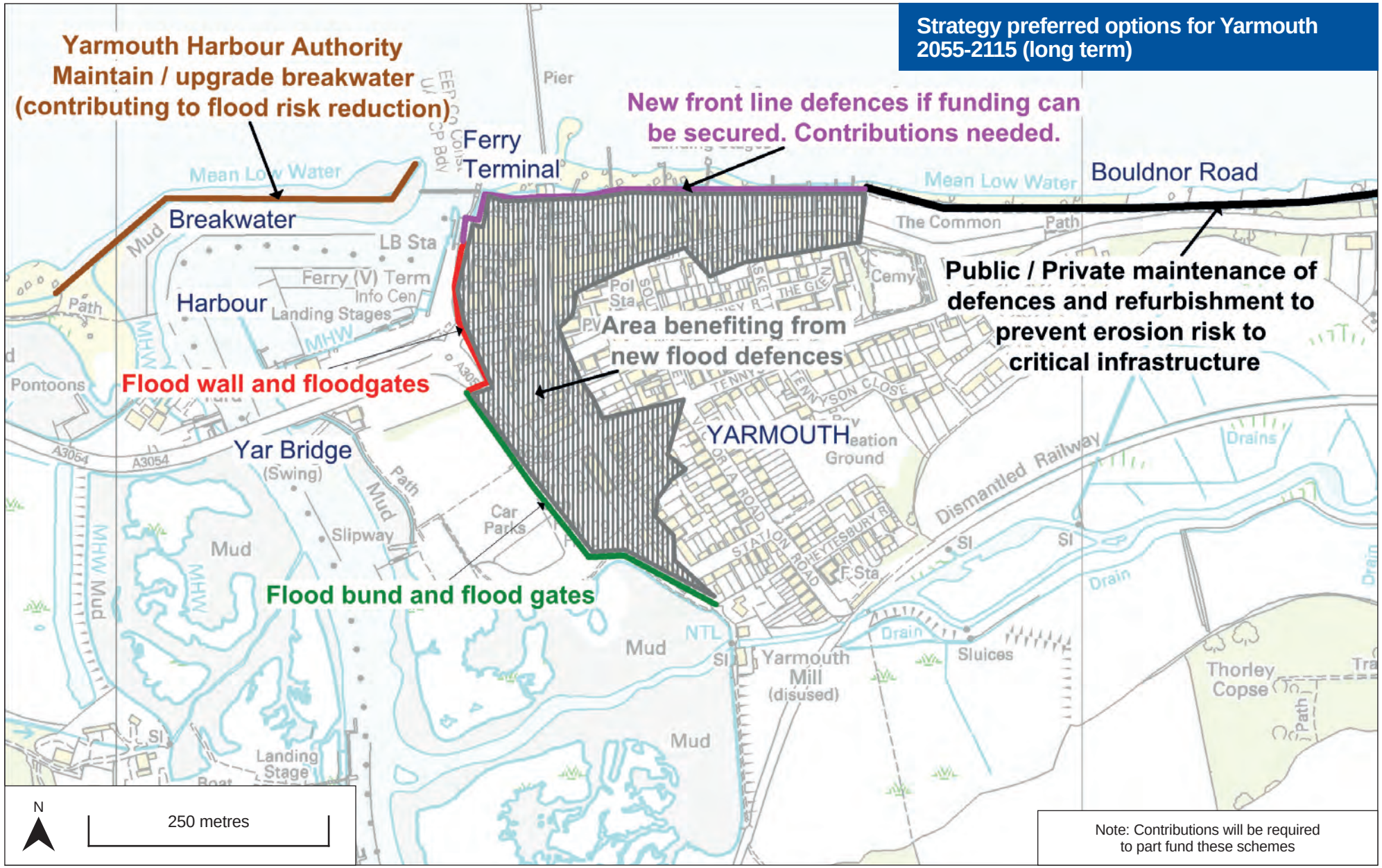


A refurbishment scheme for the existing defences will be required to prevent erosion and protect the strategically important Bouldnor Road, utilities corridor serving Yarmouth, and to prevent significant environmental impacts of breaching into Thorley Brook. Some GiA funding potential but additional funding will need to be found from other sources. At Port la Salle and the eastern end of this unit, privately funded maintenance or upgrading of private defences will be permitted (subject to the necessary consents).

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.



Map showing preferred options for Yarmouth the short to medium term (up to 2055)



Map showing preferred options for Yarmouth for the longer term (up to 2115)

SMZ 3b

Western Yar Estuary

Strategy Management Zone 3b (SMZ 3b) covers the shores of the Western Yar Estuary, as far south as, but not including, the Causeway.

Shoreline Management Policy (2011): The policy in this strategic zone is mostly 'No Active Intervention'. This policy promotes no planned investment in defending against flooding or erosion, whether or not a coastal defence has existed previously, and encourages the estuary to adapt naturally to sea level rise. The only area where the policy differs is between Thorley Brook and Barnfields Stream where after 2025 a policy of 'Managed Realignment' is promoted. This policy is a managed process that enables habitat creation to offset habitat losses elsewhere due to coastal squeeze and a transfer to a more naturally functioning valley.

Land Use: This zone contains a cycle path on the eastern side of the estuary that links Freshwater and Yarmouth. There is a low amount of commercial and residential properties, but most of the area is used for recreation and farmland.

Coastal Processes: The zone is predominately sheltered and estuarine, there is only potential for localised erosion in the north of this strategic zone if existing structures fail. It is linked to the tidal inlet of the Yar Estuary at Yarmouth.

Environment: The Western Yar Estuary is part of the Area of Outstanding Natural Beauty. Nature conservation designations include Special Area of Conservation, Ramsar, Special Protection Area and Site of Special Scientific Interest.

Coastal Defences: Most of the area is undefended. There is a concrete revetment in the area of Thorley Brook extending from Yarmouth that does not extend very far south and a small section of masonry wall on the western side of the estuary.

Flood and Erosion Risk: There is a localised slow erosion risk in the Thorley Brook area. There is also flood risk to a small number of properties.

Wider stakeholder aspirations: There are opportunities for habitat creation at Thorley brook which would benefit the environment. The cycle path is a popular route between Freshwater and Yarmouth used by walkers and cyclists.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario there would be relatively low flood and erosion risks over the next 100 years. The erosion risk is very small and localised. Whilst flood risk to properties would increase over time, this increase is expected to be very small. Most of the properties identified at being at risk in 2115 are already at risk today. Severity and frequency of flooding of the cycle path is expected to increase over time. This is expected to result in the cycle path becoming more frequently inaccessible because of flood debris on the path or damage to the path. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table overleaf.

By 2115 a total of 19 properties would be at risk of flooding from a 1:200 year (0.5% annual chance) event and a total of 2 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	4	4	3	4
Commercial	12	13	13	15
Total	**16**	**17**	**16**	**19**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2025**	**2055**	**2115**
Residental & Commercial	0	0	1	2

Properties at risk of erosion.

By 2115 the total damages in SMZ 3b would be expected to reach £3.3million.

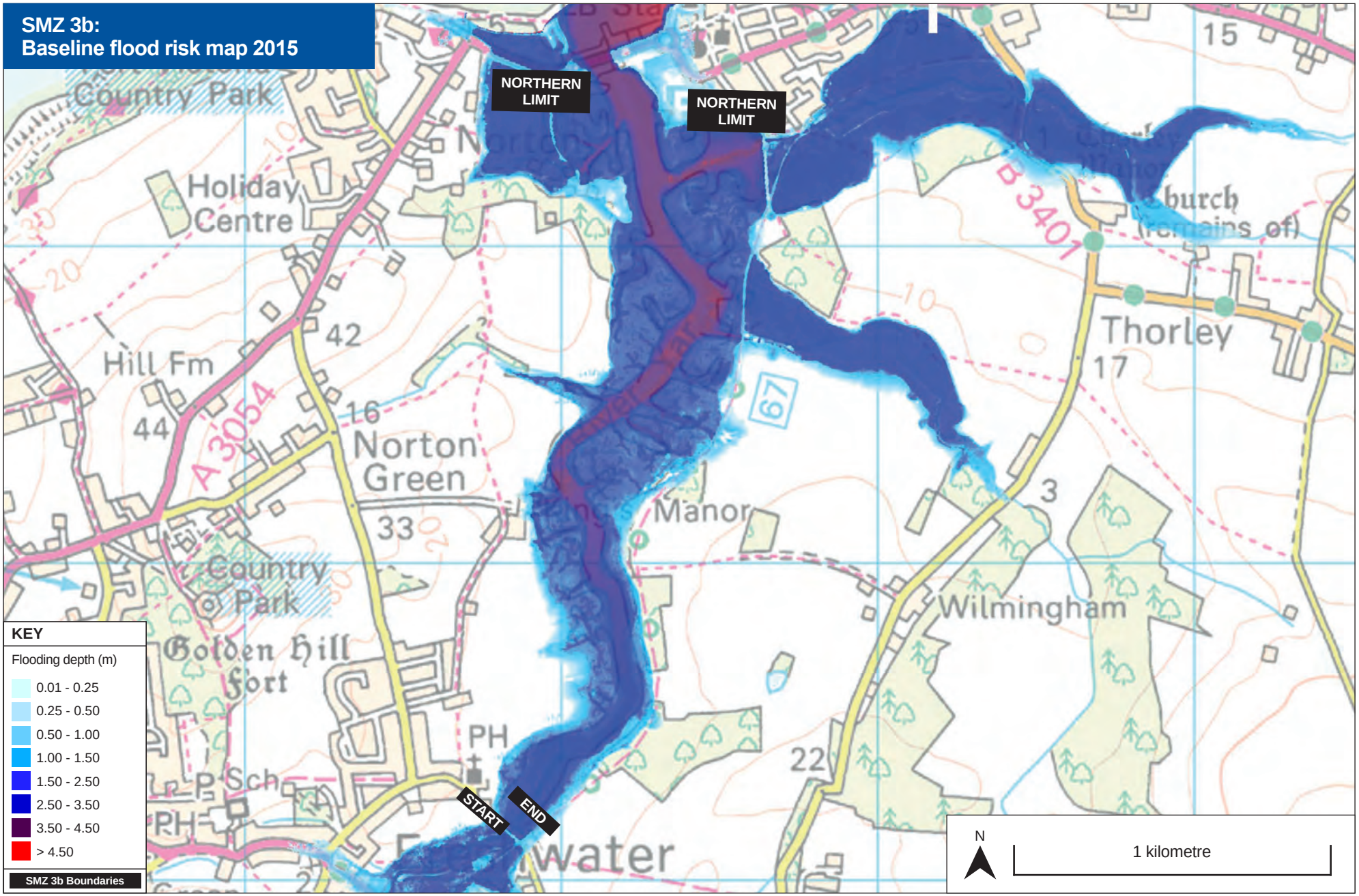
The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£2.0M
Direct erosion damages	£0.2M
Indirect damages (e.g. access)	£1.1M
Total	**£3.3M**

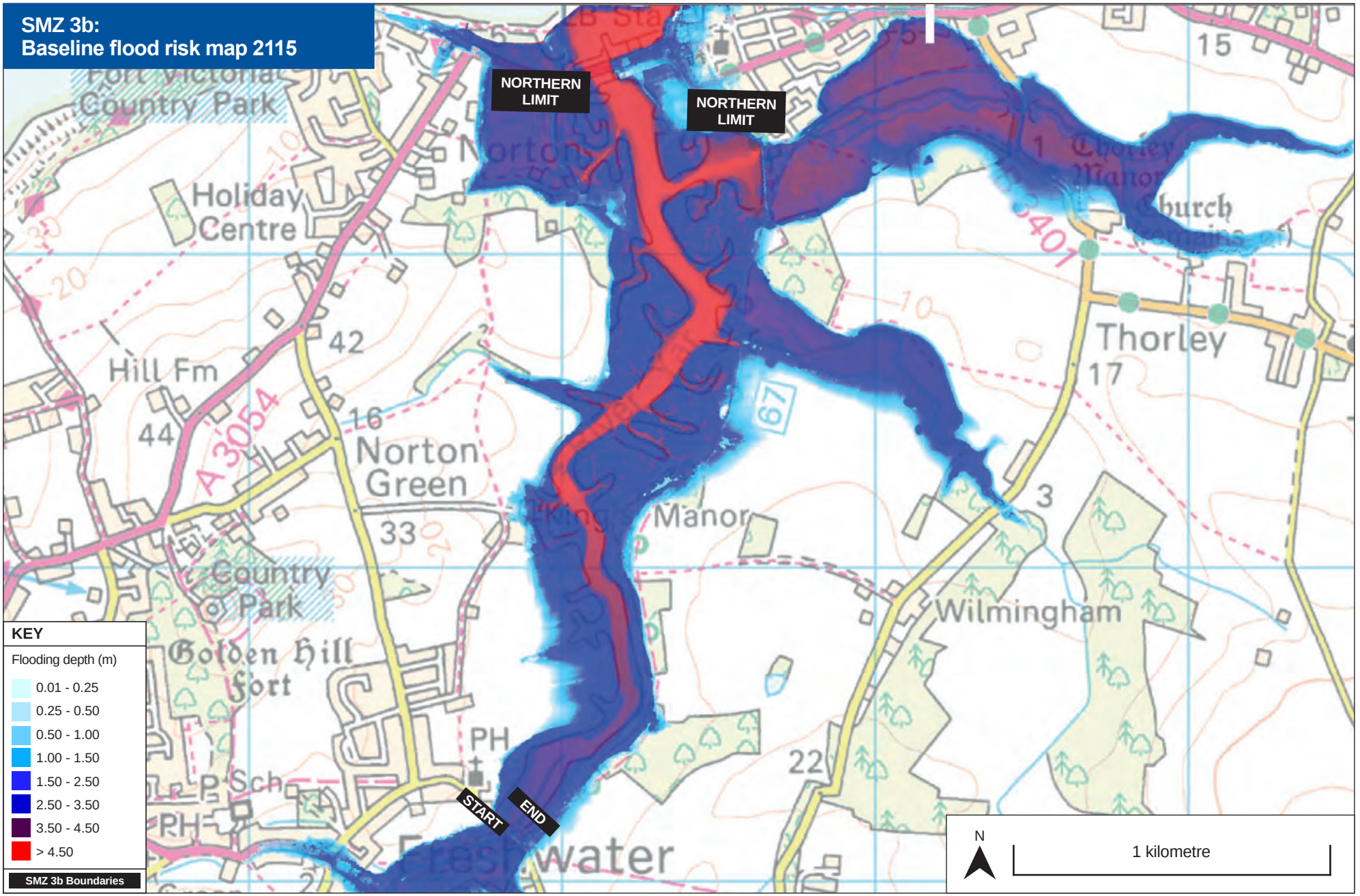
SMZ 3b whole life (100 year) do nothing damages (present value - £M)

Access and cycle ways provide an important amenity asset

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

View over the unspolit Western Yar Valley

Strategy preferred option - commentary

Given the largely rural and unspoilt nature of this environmentally designated estuarine area, with few assets at risk of flooding and erosion the **preferred option is to maintain the cycle path and footpath access for its amenity benefit** as long as this is sustainable. On the whole this will ensure that the Western Yar Valley continues to evolve with natural processes, thus helping preserve the environmentally important habitats both for the Isle of Wight and the greater Solent area.

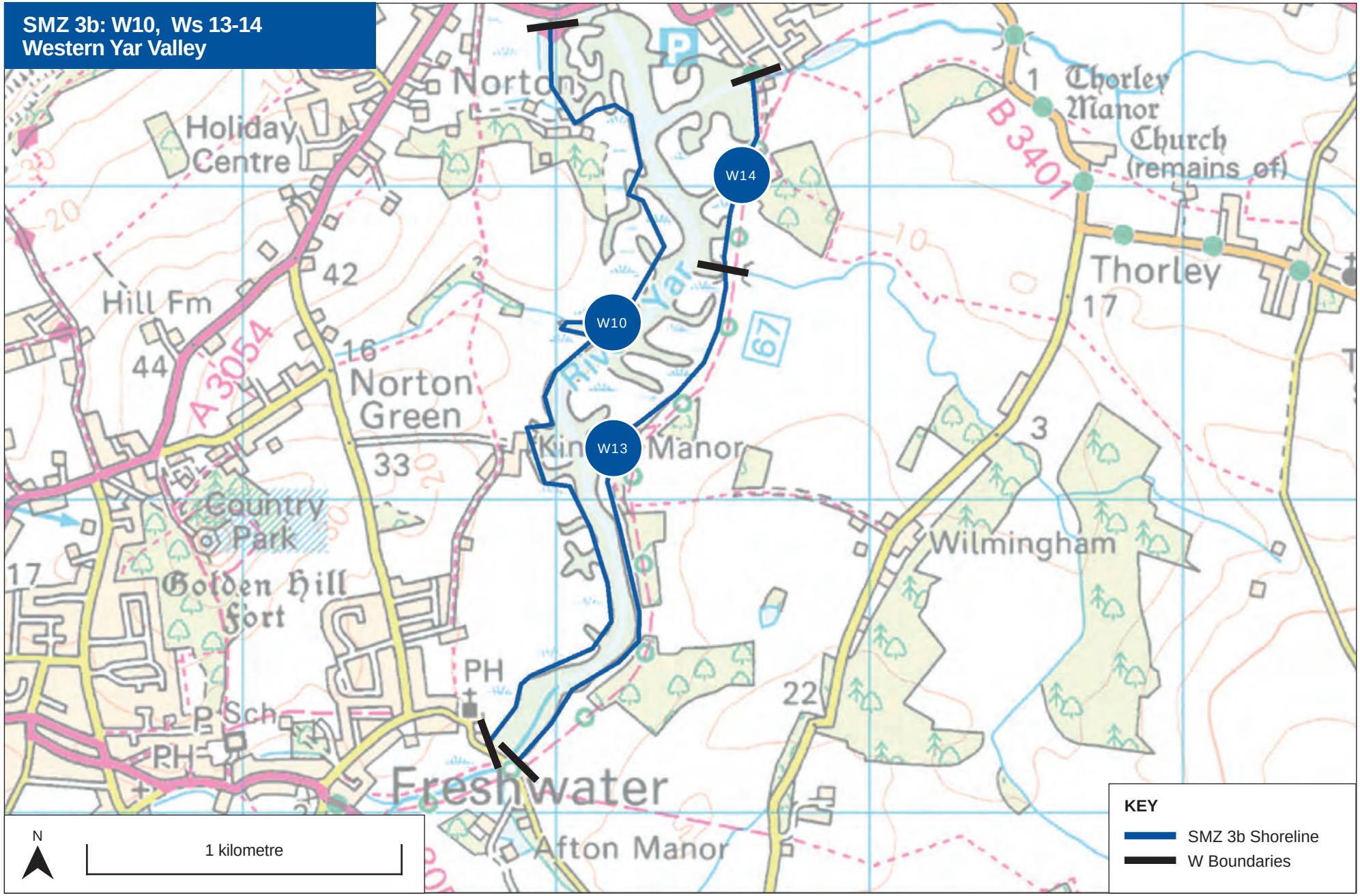
At Thorley Brook the preferred option is to undertake Managed Realignment from 2025. Managed realignment will involve removing or breaching the existing coastal defence.
New defences will be constructed behind the original defence line to ensure the continued protection of key assets. The land between the new and existing defences will then be opened up to the sea which will help to create new intertidal habitat. The creation of coastal habitat will benefit local ecology, compensate losses of habitat elsewhere along the coastline, and also help to absorb wave energy as it approaches the new line of defence. The result is an effective, sustainable solution to flood and erosion risk in the area.

The delivery of this scheme is subject to the Environment Agency securing the required funding and the delivery of compensatory grazing marsh through the Regional Habitat Creation Programme. The site is currently well used by birds for both feeding and roosting and therefore prior to realignment there will also be a need to better understand how the site is used by these birds. Mitigation will be required, including where feasible the creation of compensatory feeding and roosting sites.

Prior to managed realignment in 2025, it will be necessary to maintain the existing defences. If the managed realignment scheme is not delivered, maintenance of the existing defences fronting Thorley Brook will continue into epoch 2. To help facilitate the managed realignment scheme from 2025 onwards work to plan the scheme could begin during epoch 1.

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal



ODU W10,13 & 14 boundaries in SMZ3b

SMZ 3b Preferred Strategic Option: Maintain cycle and footpath access and health and safety compliance, and if funding can be secured, managed realignment at Thorley Brook between 2025 and 2055 to provide environmental mitigation and create intertidal habitat.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£3,824,000*	£1,271,000	0.3 : 1

*Mainly managed realignment and environmental costs

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W10 & 13 Western Yar estuary

Estuary to adapt naturally to sea level rise. Maintain coastal access and ensure health and safety compliance, with privately funded maintenance of existing assets permitted (subject to gaining the necessary consents).

W14 Thorley Brook and Barnfields Stream

Maintenance of existing defences and undertake planning for future managed realignment scheme in the medium term. From 2025-2055 implement Managed Realignment / habitat creation at Thorley Brook as required to deliver environmental mitigation and compensatory habitat, if funding can be secured. New flood setback defences to reduce flood risk to people and property to be delivered as part of the scheme.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

SMZ 3c

Freshwater

Strategy Management Zone 3c (SMZ 3c) covers Freshwater Bay, Freshwater village and the Causeway (and Afton Marsh between these locations).

Shoreline Management Policy (2011): The policy in this strategic zone is 'Hold the Line'. This policy promotes the maintenance of existing defences and implementation of new defences to manage flooding and erosion risks.

Land Use: This zone contains the town of Freshwater that has many residential and commercial properties. Freshwater Bay and the Causeway are both recreational sites. The A3055 road is also within this zone.

Coastal Processes: At the southern tidal limit of the Western Yar Estuary the Causeway is sheltered and estuarine. Freshwater Bay occupies a much more exposed position on the south coast of the Island with large swell waves that can result in waves overtopping the defences in the centre of the bay.

Environment: This area is designated as an Area of Outstanding Natural Beauty. Environmental designations along this frontage include the Freshwater Marshes Site of Special Scientific Interest and the Special Area of Conservation on the south coast. The Causeway bridge is a heritage asset included on the Local List.

Coastal Defences: The Causeway at the northern limit is a stone masonry bridge structure with two flap valves. At Freshwater Bay there are concrete walls in fair to good condition.

Flood and Erosion Risk: There is flood and erosion risk within this zone. Flood risk stems from tidal flooding from the north and more localised overtopping risk in the south.

The critical road link (A3055) along the south coast through Freshwater Bay is also at risk of flooding and erosion, and this risk will increase over time due to sea level rise.

Wider stakeholder aspirations: Maintain coastal access and maintain the natural environment. Maintain the defences at Freshwater Bay to prevent a breach scenario where the Totland and Freshwater peninsular would effectively be isolated from the rest of the island.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario the risk of erosion and flooding to property and critical infrastructure would increase over time. If the existing defences at Freshwater Bay were allowed to fail then the Afton Marsh area would increasingly be inundated with flood water, this would cause more regular flooding of the A3055 road. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table overleaf.

Today there are 28 properties at risk of flooding from a 1:200 year (0.5% annual chance) event, by 2115 there would be a total of 77 properties at risk from tidal flooding. By 2115 there would be a total of 16 properties at risk of erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	12	17	28	53
Commercial	16	18	19	24
Total	**28**	**35**	**47**	**77**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2025**	**2055**	**2115**
Residental & Commercial	0	0	2	16

Properties at risk of erosion.

By 2115 the total damages in SMZ 3c would be expected to reach over £10million.

The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

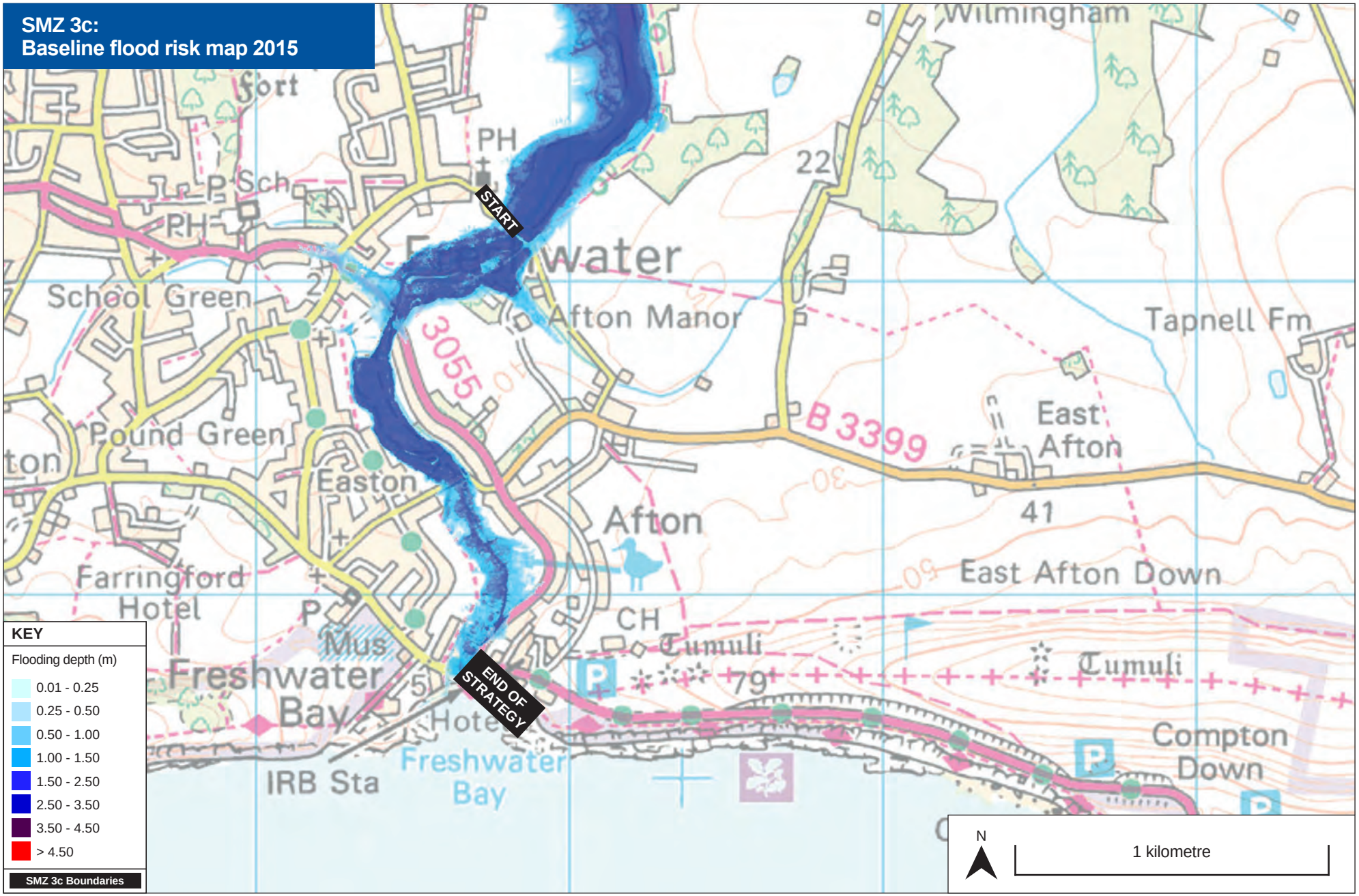
Type of damage	**PV cost of damage***
Direct flood damages	£6.8M
Direct erosion damages	£1.6M
Indirect damages (e.g. access)	£1.9M
Total	**£10.4M**

SMZ 3b whole life (100 year) do nothing damages (present value - £M)

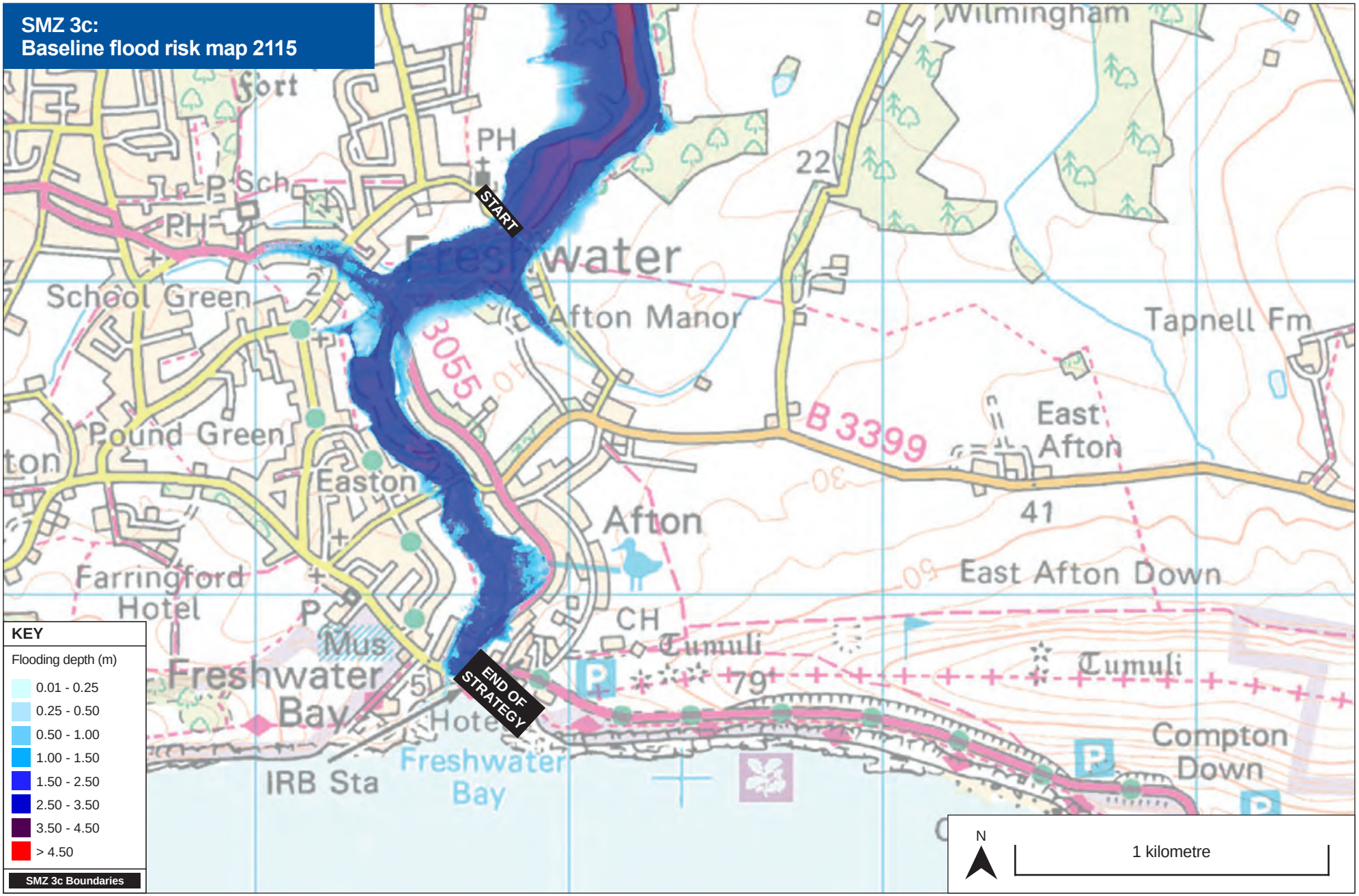
Aerial view over Freshwater Bay

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

SMZ 3c: Baseline flood risk map 2015

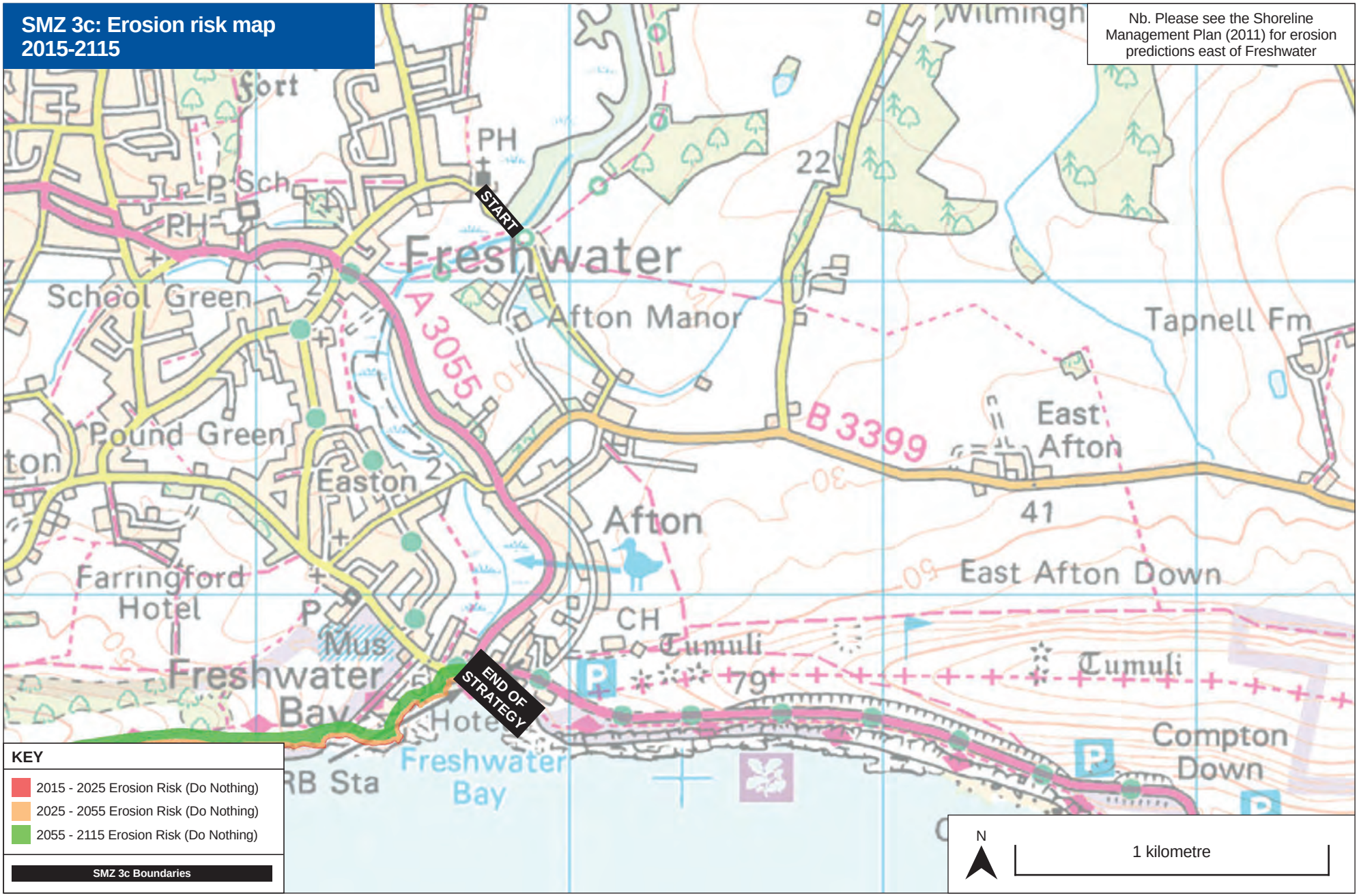


Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 3c: Erosion risk map 2015-2115



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

At Freshwater Bay the preferred option is to Maintain the existing defences and refurbish at the end of their design life. At the Causeway/Freshwater Village the preferred option is to Maintain the defences at the Causeway, recommend Property Level Protection to address localised flood risk and Improve defences from 2055.

At Freshwater Bay, this option will involve maintaining the strategically important defences (seawall) to prevent erosion to key road links and also to prevent a tidal breach to the Western Yar Valley. Future refurbishment works to the seawall will be required at the end of the structure's residual life to ensure the continued function of the defence. In the longer term further maintenance and refurbishment works will be required to the defences to prevent erosion and reduce flood risk.

Under the preferred option there will be a continued flood risk from wave overtopping to a number properties as well as the A3055. This risk is expected to increase over time due to sea level rise and no active increases in defences crest height.

The Present Value (PV) cost of the preferred option in SMZ 3c is approximately £1.5million (approximately £4.1million in cash terms). There will be limited Grant in Aid (GiA) funding available for these works. It is intended that the Isle of Wight Council (IWC) will continue work to explore potential future funding options and opportunities, possibly through delivering in partnership with other services on the Island, to maintain the strategically important defences.

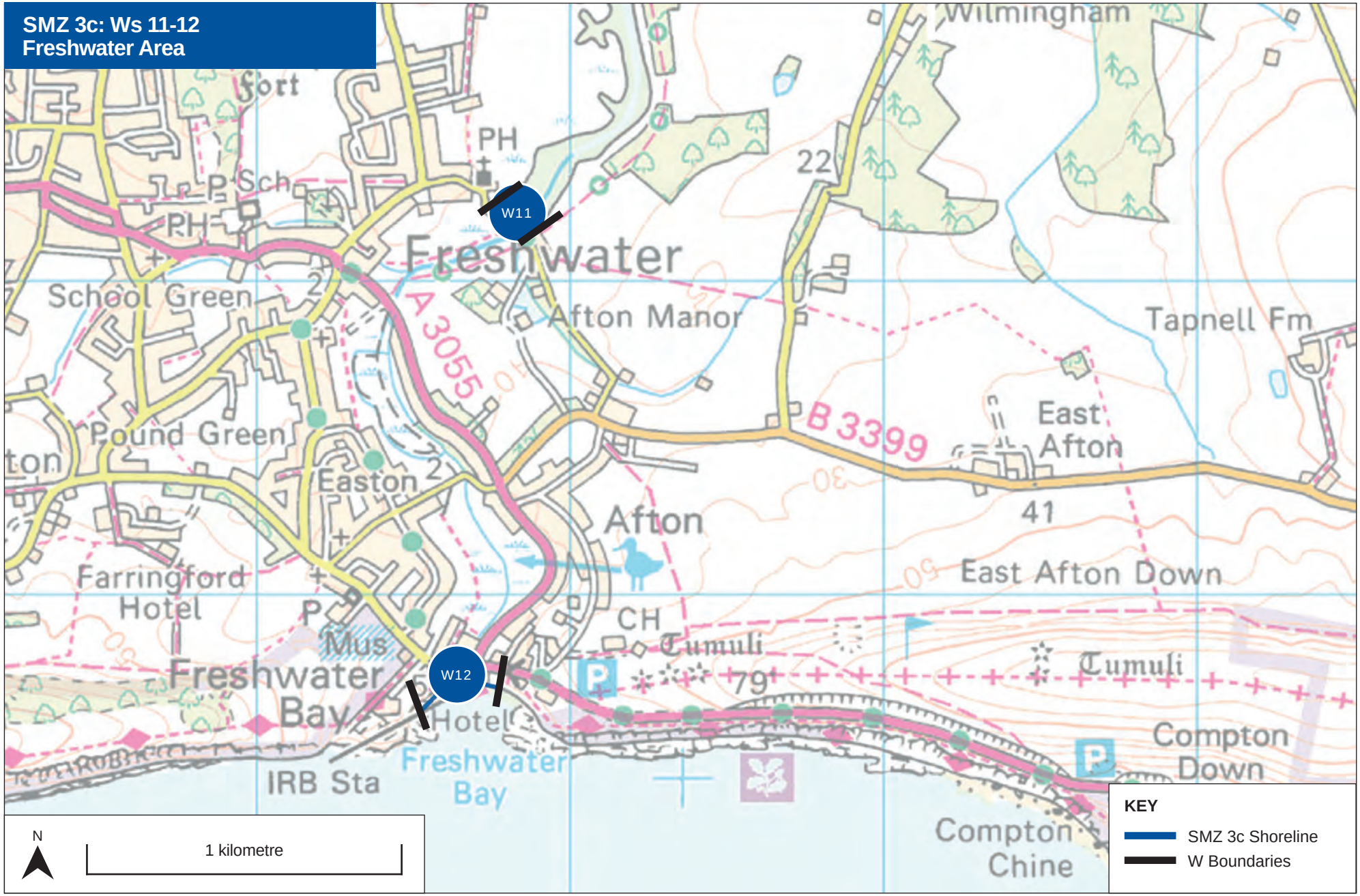
In the Western Yar Estuary, between the Causeway and the edge of Freshwater village, the preferred option involves maintaining existing defences and recommending privately funded property level protection in the short term to address the localised flood risk within this zone. The Causeway and flapped culverts will continue to be maintained to ensure its function in reducing flood risk to Freshwater.

In the medium and long term, it will be necessary to refurbish the existing defences (Causeway) and it is recommended to implement new defences (at Freshwater village) in the long term to prevent tidal flooding to commercial and residential properties near to the A3055 at the intersection with Stroud Road (subject to available funding). Here there are a number of residential and commercial properties at significant potential flood risk, mainly under extreme tidal conditions coming from the north (the Western Yar Valley at the Causeway).

In the future if there is a legal requirement to provide compensatory habitat to offset habitat losses that may arise from defending the coastline, as well as the proposed realignment at Thorley Brook (see SMZ 3b), another area which may be suitable has been identified near Freshwater, from the Causeway westwards along the valley towards the village (near the cycletrack). If feasible, habitat creation at this area could also be incorporated into a wider flood risk works for Freshwater which would deliver multiple outcomes and potentially unlock partnership funding streams. This opportunity will need to be investigated in more detail in subsequent appraisals.

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal



ODU W11 and 12 boundaries in SMZ3c

SMZ 3c Preferred Strategic Option: Maintenance of existing structures at Freshwater Bay and the Causeway. Recommend Property Level Protection to the residential properties at significant flood risk. Then, refurbishment of existing defences at Freshwater Bay at end of design life to mitigate erosion risk and implement new defences at Freshwater Village in the long term to improve the standard of flood protection.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£1,450,000	£5,514,000	3.8 : 1

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W11 The Causeway

At ODU W11, the Causeway, the preferred option is for maintenance of the existing defences for the first time epoch of the Strategy alongside privately funded PLP to properties (8 properties) in Freshwater Village to address the localised flood risk within this zone. In the medium to long term, the existing defences at the Causeway should be refurbished and it is recommended that new defences are installed at Freshwater Village in the long term to prevent tidal flooding to properties near the A3055 (subject to available funding). Ongoing refurbishment of the defences at the Causeway will need to continue into the longer term, whilst maintenance of the new defences at Freshwater Village will also be required. In future appraisals, a potential managed realignment area from the Causeway westwards should be investigated in more detail to establish the feasibility of creating habitat in this area and also the viability of linking this into a wider flood risk reduction scheme in the area.

Planning and further investigations for this work could be undertaken from epoch 2 onwards. Further discussions with the Environment Agency and other stakeholders are required to help facilitate this.

W12 Freshwater Bay

At Freshwater Bay in the short term the preferred option recommends ongoing maintenance of the existing seawall in front of the A3055. After this, in the medium and long term, it is likely that ongoing capital refurbishment will be required for this structure at it's current height (primarily for erosion protection and to prevent a breach into the low-lying Western Yar Valley). There is likely to be limited Grant in Aid funding available for these works so contributions will be required to fund this scheme.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

Undefended Solent Shoreline, Thorness Bay

SMZ 4

Newtown Coast

Bouldnor Cliff to Thorness Bay, including Newtown Estuary

SMZ 4

Newtown coast

Strategy Management Zone 4 (SMZ 4) is located between Bouldnor and Thorness Bay, including the Newtown Estuary.

Shoreline Management Policy (2011): The policy for this strategic zone is 'No Active Intervention'. This policy promotes no planned investment in defending against flooding or erosion, whether or not a coastal defence has existed previously.

Land Use: Mainly rural with a natural environment and open space. The area is valued for recreation, and there is a coastal path that runs the whole length of the SMZ, albeit coming inland to negotiate the Newtown Estuary.

Coastal Processes: This is a sheltered and natural open coast frontage with tidal inlets present at Newtown and Thorness Bay, The SMZ is characterised by a low energy wave climate, but strong tidal currents exist at the mouth of the Newtown Estuary. The morphology mainly comprises cliffs fronted by narrow sand and gravel beaches in places, and low-lying valleys around the inlets.

Environment: The entirety of this frontage is designated as an SPA, with Newtown Estuary being designated as an SAC, Ramsar site, SPA, SSSI and NNR. In addition there are a number of SINCs in the wider area. There are Conservation Areas at Newtown and Shalfleet and parts of the abandoned medieval town of Newtown, including burgage plots and ridge and furrow, are designated as Scheduled Monuments. Bouldnor Battery is also a Scheduled Monument. There are numerous undesignated heritage assets including the lithic scatters, prehistoric and Roman wooden structures and palaeoenvironmental deposits at the mouth of the estuary and similarly at Thorness Bay. The iconic landscape of the Newtown Estuary and the coast of this unit is designated as an AONB and heritage coastline.

Coastal Defences: The frontage is predominately undefended. What minor structures and quaysides are present are situated in the Newtown Estuary have been built to improve access within the estuary. There are a number of masonry and timber walls, and they are in a fair condition overall.

Flood and Erosion Risk: The risk of flooding is generally low and localised in this SMZ for the duration of the Strategy. There is a risk of erosion along the open coast and spits and this is greatest at the cliffs located near Bouldnor and Thorness.

Wider stakeholder aspirations: Maintain coastal access whilst maintaining the natural environment.

Baseline – what would happen if we did nothing?

Under the policy of 'No Active Intervention' the risks of flooding from a 1:200 year event would continue to be negligible. However a in the longer term there is an increasing risk of erosion to scattered properties, environmental assets and the coastal path.

By 2055 there would be a total of 12 properties at risk of erosion, by 2115 a total of 59 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2025**	**2055**	**2115**
Residental & Commercial	0	1	12	59

Properties at risk of erosion.

In addition to the properties at risk of erosion, a small number of localised properties are also at risk from flooding over the Strategy period.

By 2115 the total damages in SMZ 4 would be expected to reach £2.1million.

The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£0.0M
Direct erosion damages	£2.1M
Indirect damages (e.g. health)	£0.0M
Total	**£2.1M**

SMZ 4 whole life (100 year) do nothing damages (present value - £M)

Environmentally important habitats in Newtown Estuary

Boardwalks with amenity value

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

SMZ 4: Erosion risk map 2015-2115

Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

Given that this zone has very low flood risk and only localised erosion risk to property, is largely undefended, and is valued for its natural beauty and environmental importance, **the preferred strategic approach is to work with nature to maintain and enhance the landscape and environment.** The Isle of Wight Council will not repair or maintain defences, and no new defences will be permitted where they are not already present.

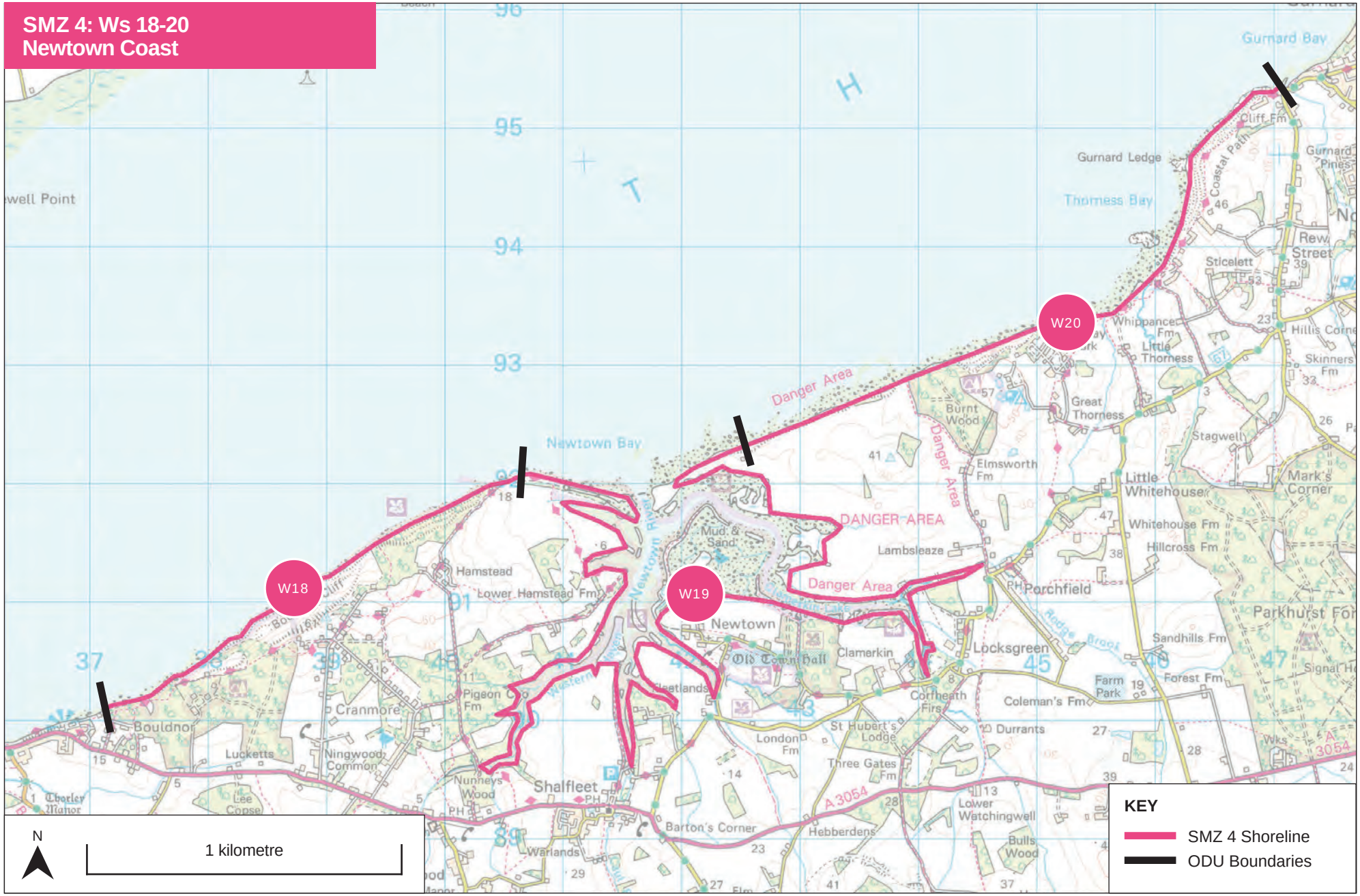
It is recognised that **local erosion risks to businesses, people and coastal footpaths will need to be mitigated or adapted to. Privately funded maintenance of existing structures will be permitted (subject to gaining the necessary consents).**

The preferred option will ensure that the natural landscape of the Heritage Coast and Estuary, is allowed to evolve naturally.
The preferred option will ensure that coastal processes will continue in an unhindered manner thus maintaining sediment transport pathways which is important for nourishing the beaches of the adjacent frontages.

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal

The north-west coast



ODU W18-20 boundaries in SMZ4

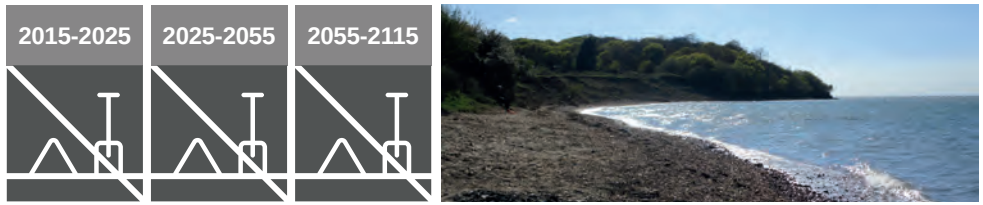
SMZ 4 Preferred Strategic Option: Allow natural processes to continue. Privately funded maintenance of existing assets permitted (subject to gaining the necessary consents).

PV Cost*	PV Benefits*	Benefit:Cost ratio
£0	£0	N/A

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W18-20 Bouldnor to West of Gurnard Bay



Allow natural processes to continue, with privately funded maintenance of existing assets permitted (subject to gaining the necessary consents). No new defences permitted. Health and Safety obligations relating to eroding coastline to account for.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

View east along Gurnard Bay Esplanade

SMZ 5

Gurnard and Cowes Headland

Gurnard Luck to Cowes Parade

SMZ 5a

Gurnard Luck and Gurnard cliff

Strategy Management Zone 5a (SMZ 5a) encompasses Gurnard Luck and Gurnard cliff.

Shoreline Management Policy (2011): The policy at Gurnard Luck is 'Hold the Line' to 2025. This policy supports the maintenance of existing private defences in the short term, then the policy changes to 'No Active Intervention' as a result of increasing risks of both tidal and fluvial flooding and erosion. The SMP also highlighted the need for adaptation (see Chapter 4.2 of the SMP, 2011). The policy along Gurnard cliff is 'No Active Intervention'. The SMP policies reflect the funding and affordability constraints faced for this area, leading to significant challenges in delivering sustainable flood and erosion risk management intervention, especially in the future with projected climate change.

Land Use: There are residential and commercial properties at Gurnard Luck as well as a small harbour. Several properties have been raised up by the homeowners to increase resilience against flooding. At Gurnard cliff there are residential properties set back from the clifftop.

Coastal Processes: This frontage is on the open coast but is relatively sheltered from waves, being situated within the Solent. Gurnard cliff is within a zone identified as having some potential for landslide reactivation.

Environment: Gurnard Bay is designated as a Special Protection Area and Site of Interest for Nature Conservation. There are a number of listed buildings but these are set back from the Strategy frontage.

Coastal Defences: At Gurnard Luck there are masonry and concrete walls present with a wide range of conditions. The community has recently carried out maintenance and upgrades to the seawall and has implemented new timber board defences and setback walls to reduce wave overtopping impacts. There are no defences at Gurnard cliff.

Flood and Erosion Risk: At Gurnard Luck the crest levels of existing defences are relatively low in comparison to other areas in the Strategy. As a result there is a significant risk of flooding at this location both from tidal and fluvial (tide locking) flooding. A slow but ongoing erosion risk exists to the frontage and because of the close proximity of properties to the coastline this results in a number of properties being at risk over the period of the Strategy. Along Gurnard cliff the properties are generally set back from the coastline, so that only a very small numbers of properties are at risk from erosion. This area is on the edge of the Cowes-Gurnard potential landslide reactivation zone, although the scale and location of such an event are uncertain.

Wider stakeholder aspirations: Maintain coastal access and the character of the area. The community has already started taking steps to adapt to flood and erosion risks in the area with recent maintenance and upgrades carried out on some of the private defences. There is strong community preference for improving current defences to provide more robust management of flood risk at Gurnard Marsh.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario the erosion risk will increase over the next 100 years, with the majority of properties at risk of erosion in the last 50 years. There is current and future tidal and fluvial flood risk in this low-lying area. In due course, the number of properties being flooded from a 1:200 year event is expected to decrease, but only because the same properties are predicted to be at risk of erosion. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table below.

Today there are 43 properties potentially at risk of being affected by flooding from a 1:200 year (0.5% annual chance) event. However it should be noted that due to some properties having raised floor levels, the number of properties at risk of flooding internally may be lower. By 2115 a total of 54 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	2015	2025	2055	2115
Residential	38	38	32	4
Commercial	5	5	4	4
Total*	**43**	**43**	**36**	**8**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115

*Number of properties at risk of flooding reduces over time despite rising sea levels as some of the properties at risk of flooding are lost due to erosion under a 'Do Nothing' Scenario.

	Time Horizons			
Properties at risk from erosion▾	2015	2025	2055	2115
Residental & Commercial	0	0	19	54

Properties at risk of erosion.

By 2115 the total damages in SMZ 5a would be expected to reach £6.3million.

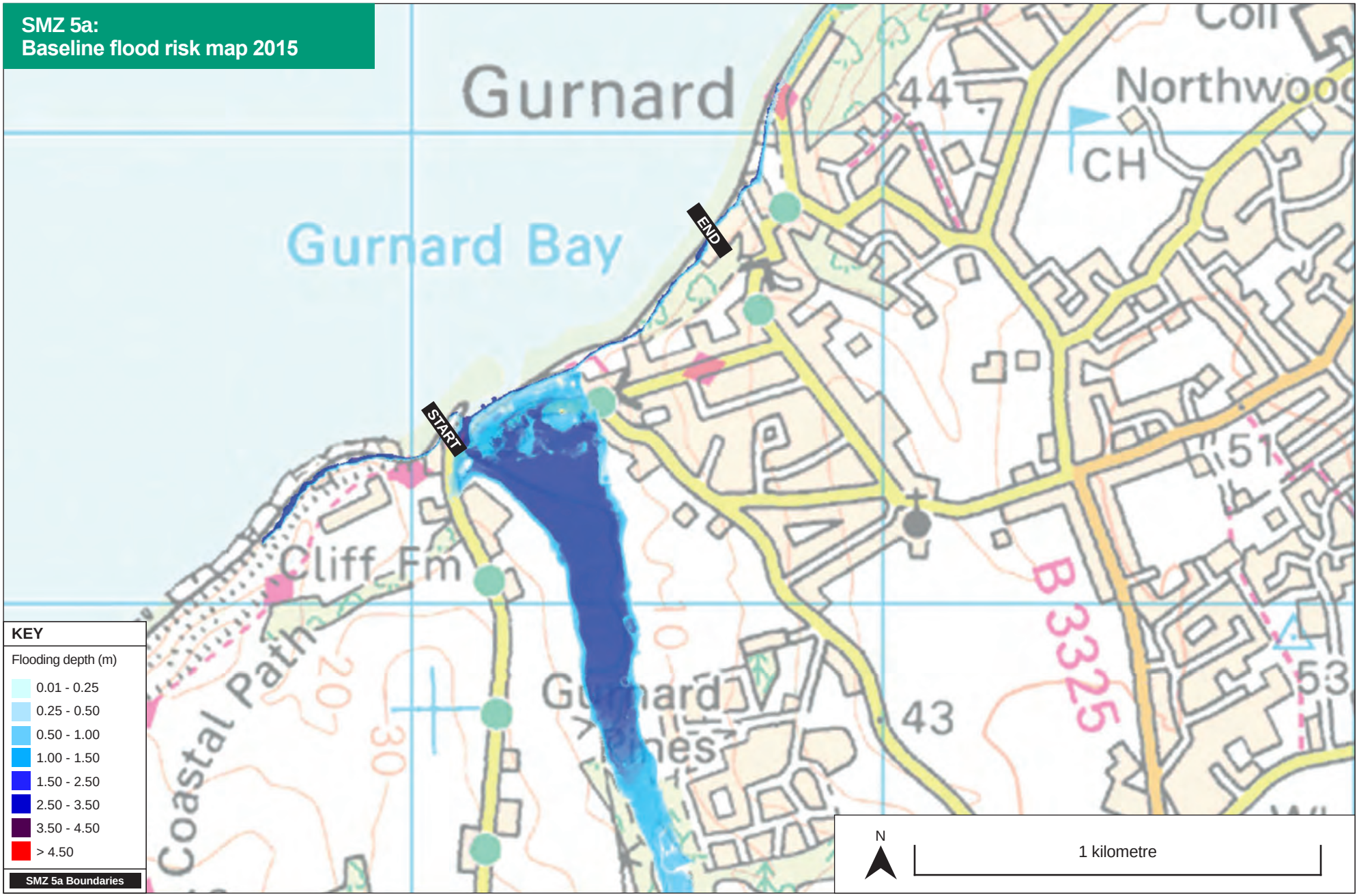
The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£4.0M
Direct erosion damages	£2.0M
Indirect damages (e.g. amenity)	£0.3M
Total	**£6.3M**

SMZ 5a whole life (100 year) do nothing damages (present value - £M)

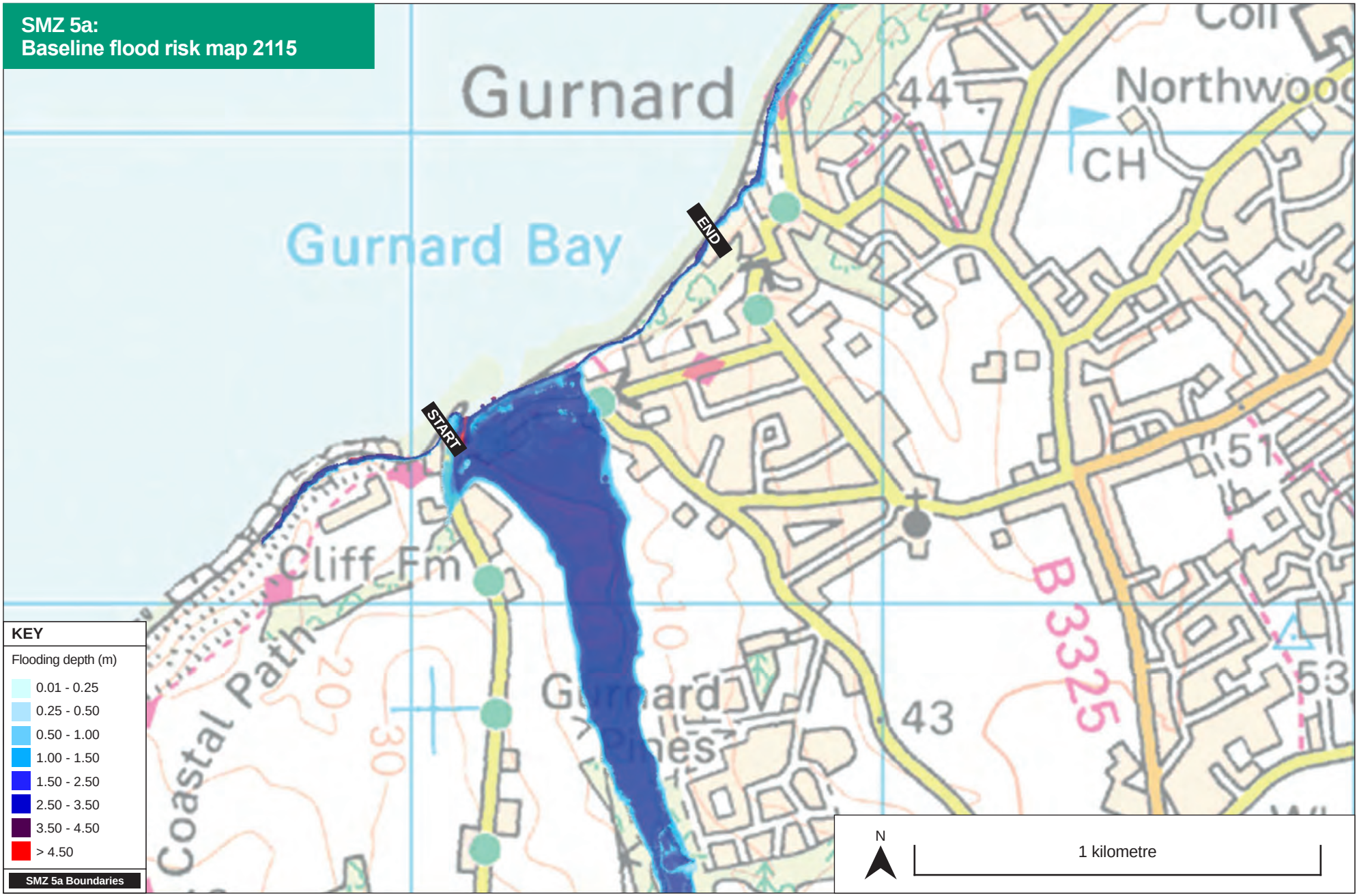
*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

SMZ 5a:
Baseline flood risk map 2015



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 5a: Baseline flood risk map 2115



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 5a: Erosion risk map 2015-2115

Nb. Please see SMZ 5b for more information on landside risk (the hatched area)

Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

This community area is at risk of both tidal and fluvial flooding, and also wave overtopping. There is also erosion risk from the north and the west, as demonstrated by a recent localised wall failure in front of the beach chalets, which has since been repaired through a community led initiative and flood recovery funding.

In the future, as the multiple risks from tidal flooding, fluvial flooding and erosion increase, the community will need to continue to adapt. Some properties in Gurnard Luck have already taken action to adapt to flood risk by raising the level of their properties, and these measures should continue to be implemented as appropriate (subject to planning consent). A long term built solution to reduce the risks over the next 100 years is not achievable as the level of investment required to provide substantial defences right around the settlement is not justified due to the limited number of properties.

The Strategy recommends privately-funded community and property level flood resilience and adaptation at Gurnard Luck. Where possible self-help measures to reduce potential flood ingress and damage should be implemented. Some properties in the area may be more suitable for flood "Resilience" measures (i.e. accepting flood water will enter the property and plan for that, e.g. raise the height of the electrical installation) than "Resistance" measures (which are designed to prevent water entering the individual property, where this can be achieved). **Privately-funded maintenance of existing coastal defences will also be permitted (subject to gaining the necessary consents).**

The Isle of Wight Council (IWC) will work with community to develop and implement a Coastal Change Management Area plan, supported by the IWC planning process, which will clearly set out the strategy to respond and adapt to the risks, and to avoid inappropriate development in areas at risk. Environment Agency (EA) operation of control structures at the mouth of Gurnard Luck stream is expected to continue whilst feasible. Sound flood response plans linked to EA flood warning systems should continue to be developed and adopted by the community to reduce risks.

The Strategy recognises that there is a strong community aspiration to improve the Standard of Protection against flooding at Gurnard Luck. Following consultation feedback, further more detailed appraisal of scheme options was carried out to explore the technical and economic case for implementing new raised defences. The outcome of these studies confirmed the need for the adaptation approach outlined above, but also examined the potential for a smaller-scale scheme to reduce risks in the short to medium term. Such a scheme could utilise existing defence elements, and supplement them with additional raised set-back defences around the harbour and along sections of the waterfront, with the aim of achieving a more limited standard of protection (to a current 1:75 year standard) to reduce *tidal flood* risks to existing properties. The assessment has determined that such a scheme has some economic merit but would require significant local funding contributions to proceed. Further more detailed technical assessment would also be required before seeking to progress a scheme to ensure that other sources of potential flood risk (e.g. tide locking of fluvial flows) are adequately considered, mitigated and not exacerbated by new defences. The assessments undertaken have also confirmed that in the longer term it will become increasingly challenging and unsustainable to mitigate flood and erosion risk if climate change occurs as projected. Due to the increasing long-term risks, the IWC will not be prioritising investment in flood defences or maintenance in this area. A significant funding shortfall would need to be met by the local community (of approximately £200k) in order to supplement potential national Grant in Aid Funding (of a similar amount) for a small scheme.

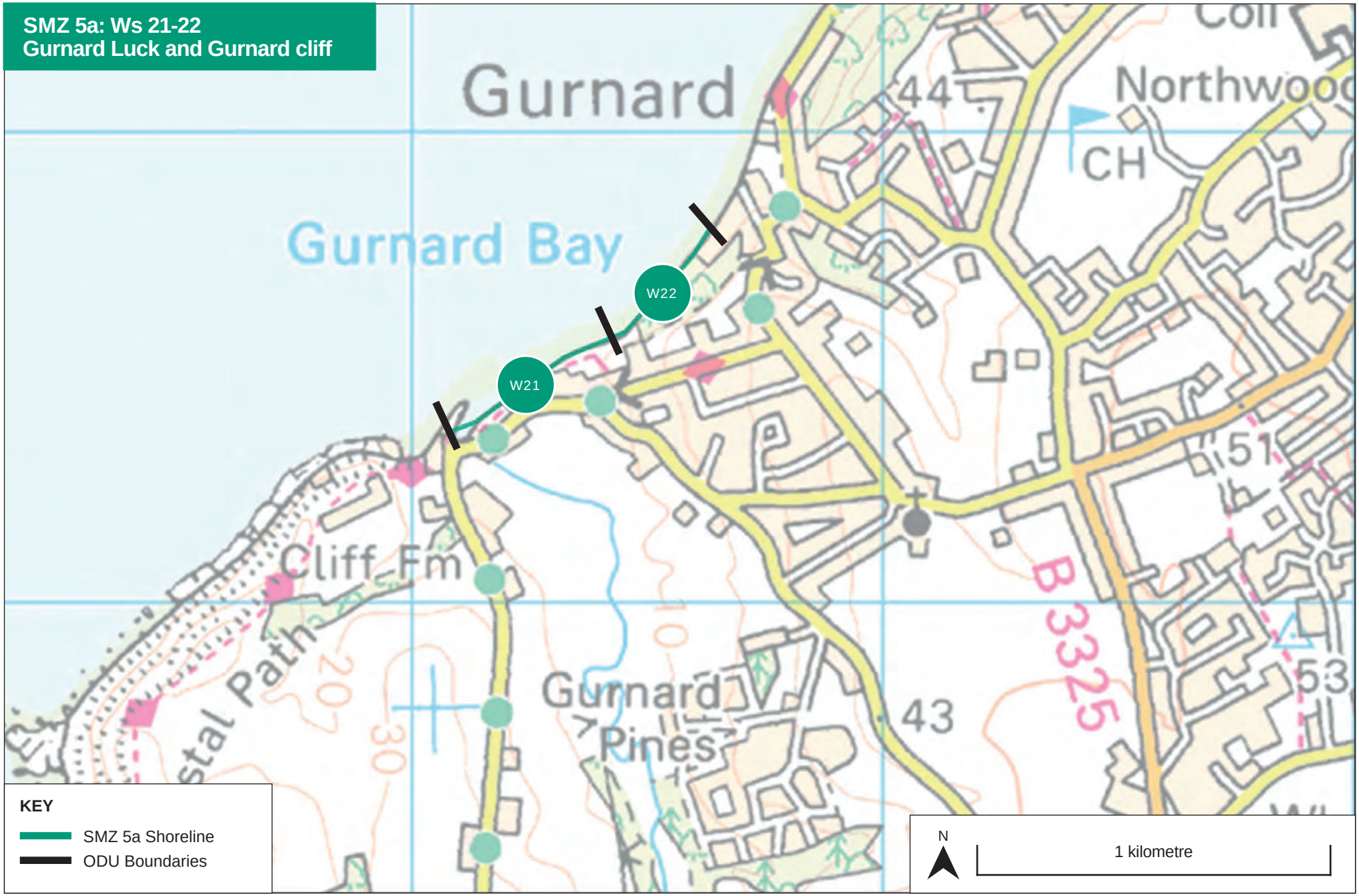
Therefore, in the absence of available contributions to progress a scheme delivering new tidal flood defences the Strategy recommends community and property level resilience and management of flood risk, with adaptation to the increasing risks. This is the primary approach that this Strategy will deliver. However, if the required contributions for a small scheme could be raised, and it can be demonstrated through further more detailed assessment that such a scheme is technically sound (in respect to other sources of flooding), and is fully supported by those affected, then delivery of required interventions to more robustly reduce flood risk in the short to medium term is recommended.
It should be noted that in the event of a small scheme being undertaken, adaptation and flood resilience will still be required within the community. Although such a scheme could provide an improved and modest level of protection, it would be of a relatively short-term nature. The standard of protection will fall over time (with predicted sea-level rise) and there would be the risk of a large-scale event exceeding the height of defences. In the longer-term adaptation will still be needed in this low-lying area in the face of increasing risks.

At Gurnard Cliff there is very limited risk to assets and the preferred option is to allow natural processes to continue.

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal

Gurnard Bay



ODU W21-22 boundaries in SMZ 5a

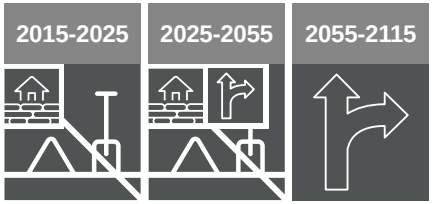
SMZ 5a Preferred Strategic Option: Privately funded community and property level flood resilience and adaptation at Gurnard Luck (up to 2055). Private maintenance of existing assets permitted (subject to obtaining the required consents). In the longer term accept that flood risk will increase due to sea level rise but provide a Coastal Change Management Area Plan to support the No Active Intervention policy. Do Minimum (maintain health and safety) at Gurnard cliff.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£239,000	£1,637,000	6.8 : 1

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

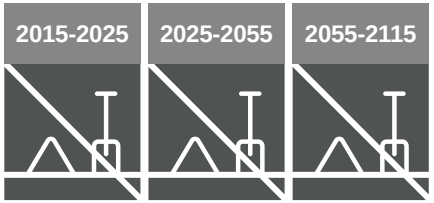
W21 Gurnard Luck



In the short term community and property level resilience and adaptation measures are recommended to reduce flood risk to a small number of properties. Due to lack of available funding, it is likely that these measures, along with asset maintenance, will need to be privately funded.

From 2025 onwards a Coastal Change Management Area plan will be developed and implemented by the council to help facilitate community adaptation to increasing levels of risk posed by sea level rise.

W22 Gurnard Cliff



Allow natural processes to continue but ensure health and safety compliance.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

SMZ 5b

Gurnard to Cowes Parade

Strategy Management Zone 5b (SMZ 5b) includes the Cowes to Gurnard headland, from Gurnard Bay (east of Gurnard cliff) to Cowes Parade.

Shoreline Management Policy (2011): The policy in this strategic zone is 'Hold the Line'. This policy promotes the maintenance of existing defences and implementation of new defences to manage flooding and erosion risks.

Land Use: There are a number of residential properties around the headland behind the coastal road. This area is popular for recreation and amenity due to the beaches, esplanade and sailing industry. There are a number of beach huts in Gurnard Bay. Further east towards Cowes there are also commercial properties near The Parade. There are also cross-Solent utility links in this area.

Coastal Processes: This frontage is on the open coast but is relatively sheltered from waves being situated within the Solent. This area is within a zone identified as having widespread potential for landslide reactivation.

Environment: Along this frontage the coastline is designated as a Special Area of Conservation, there is also a Site of Interest for Nature Conservation at Princes Esplanade Wood. West Cowes Castle is a listed building. There are also listed buildings on Queens Road.

Coastal Defences: This area is defended mostly with concrete/ masonry/sheet pile sea walls. There are a number of slipways too. The condition of these assets is generally very good to fair; in some small sections the condition is poor.

Flood and Erosion Risk: The flood risk to properties is small in this area because of the rising topography. The seafront road is at risk from flooding, but only a small number of isolated properties are at risk. The most concentrated area with properties at risk of flooding is behind The Parade car park. Erosion is more of a significant risk in this zone with properties behind Prince's Esplanade/Egypt Esplanade/Queen's Road being at risk over 100 years. There is also significant risk of this area being a possible landslide reactivation zone, although the scale and location of such events are uncertain. This risk is currently minimised by the present coastal defences along the toe of the developed coastal slopes.

Wider stakeholder aspirations: Maintain coastal access and the character of the area. Maintain the promenade and beaches for amenity.

Baseline – what would happen if we did nothing?

The majority of the risk in this strategic zone is from erosion. If the present defences are allowed to fail there would be an ongoing and increasing risk from erosion and landslide reactivation. There is low flood risk to properties. The seafront roads are more at risk from flooding, it has been seen in past events that waves overtop the seawalls. However, the seafront roads are localised rather than strategic road links and therefore disruption due to flooding is expected to be low.

Under a 'No Active Intervention' scenario the erosion risk will increase over the next 100 years, with the majority of properties being eroded in the last 50 years event (which has a 0.5% chance of occurring in any year) are shown in the table below.

Today there are 4 properties at risk of flooding from a 1:200 year (0.5% annual chance) event. By 2115 a total of 269 properties would be at direct risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	2	3	7	0
Commercial	2	3	1	0
Total	**4**	**6**	**8**	**0**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2025**	**2055**	**2115**
Residental & Commercial	0	0	44	269

Properties at risk of erosion.

Properties at risk from landslide reactivation: In addition to the properties listed above, there are 247 properties in the zone of possible landslide reactivation along the coastal slopes of the headland (currently benefiting from the existing coastal defences to reduce risk).

By 2115 the total damages in SMZ 5b would be expected to reach over £23million.

The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

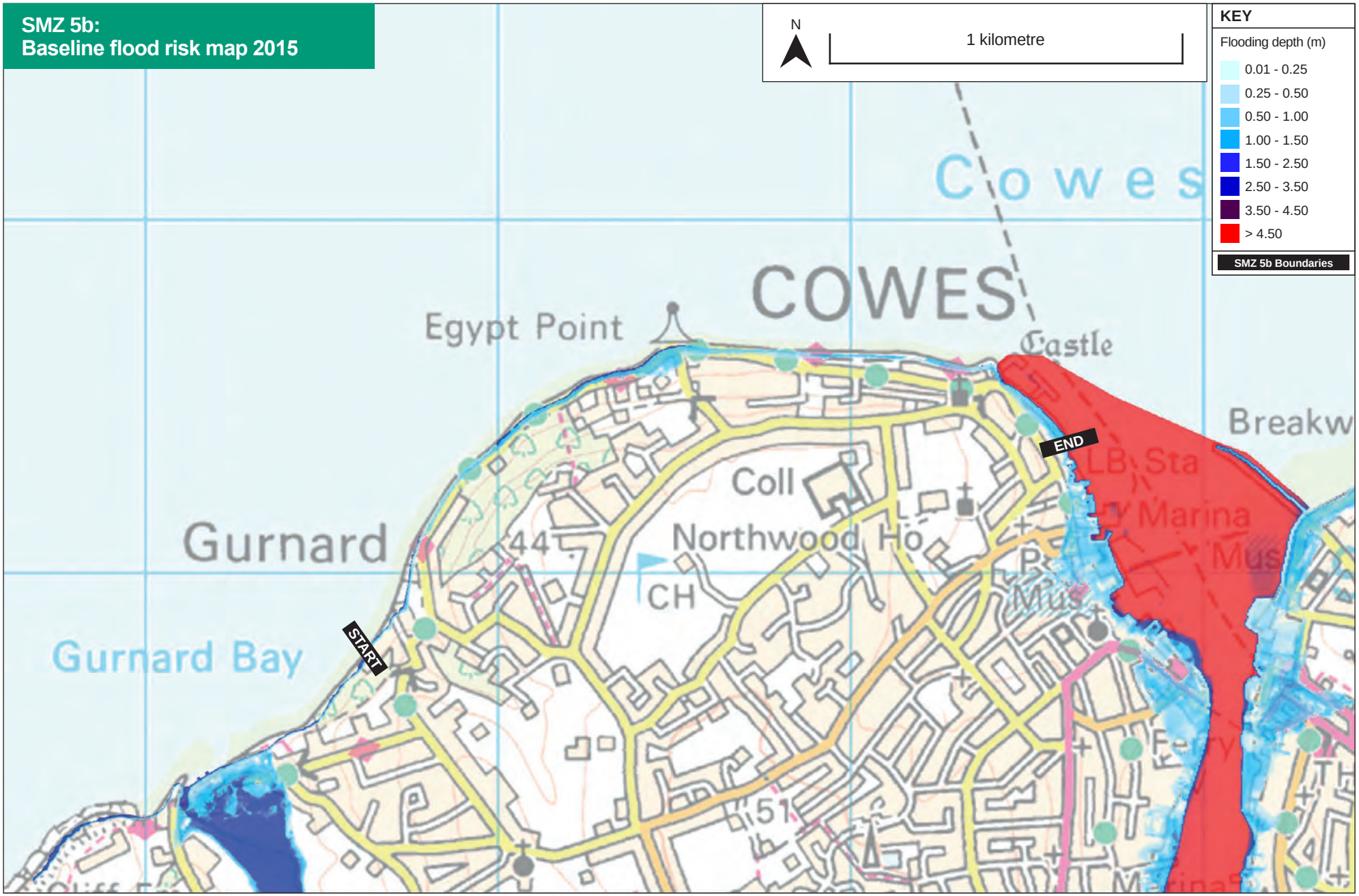
Type of damage	PV cost of damage*
Direct flood damages	£0.1M
Direct erosion damages	£23.1M
Indirect damages (e.g. amenity)	£0.6M
Total	**£23.9M**

SMZ 5b whole life (100 year) do nothing damages (present value - £M)

Cowes Esplanade

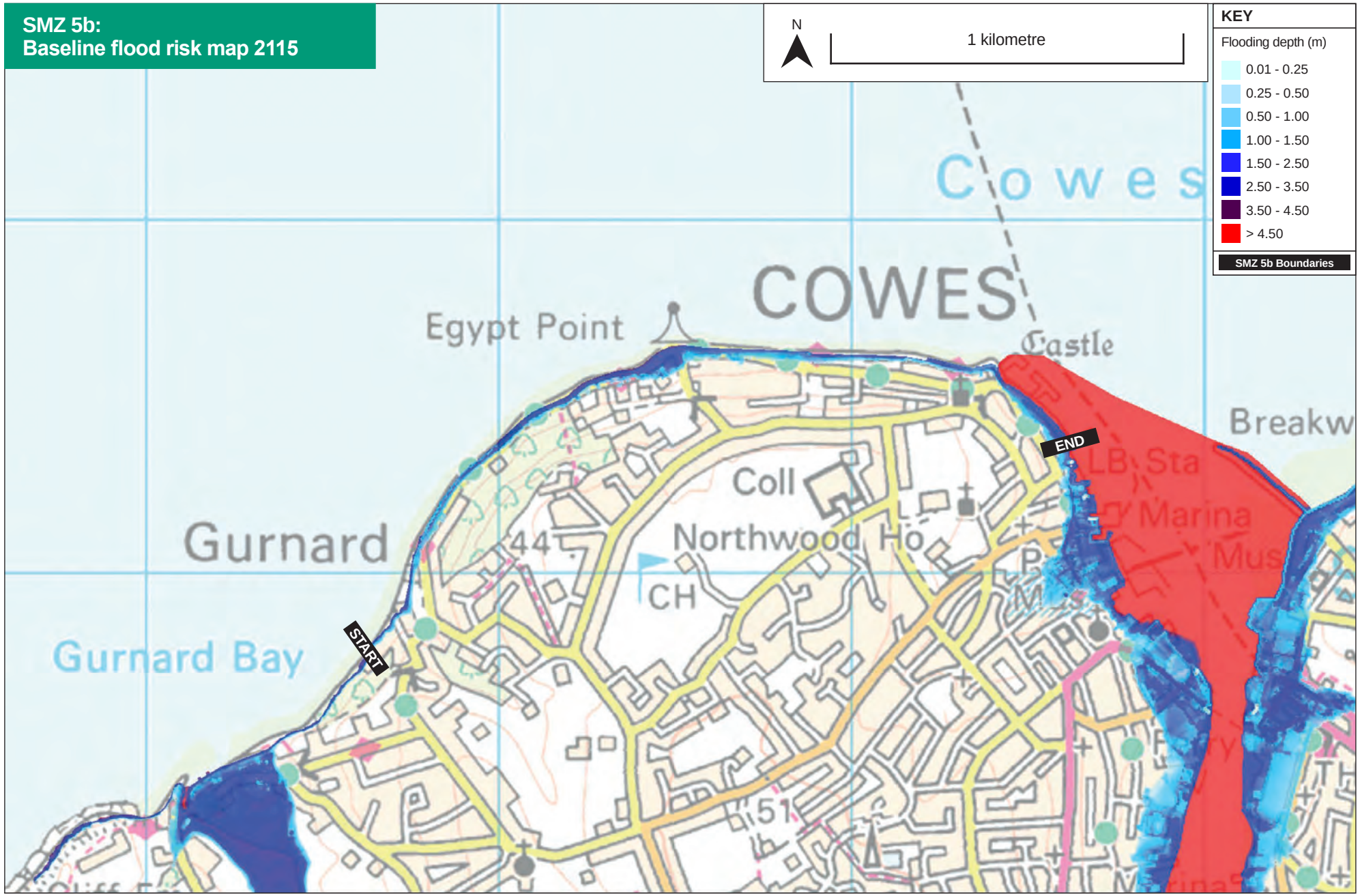
*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

SMZ 5b:
Baseline flood risk map 2015



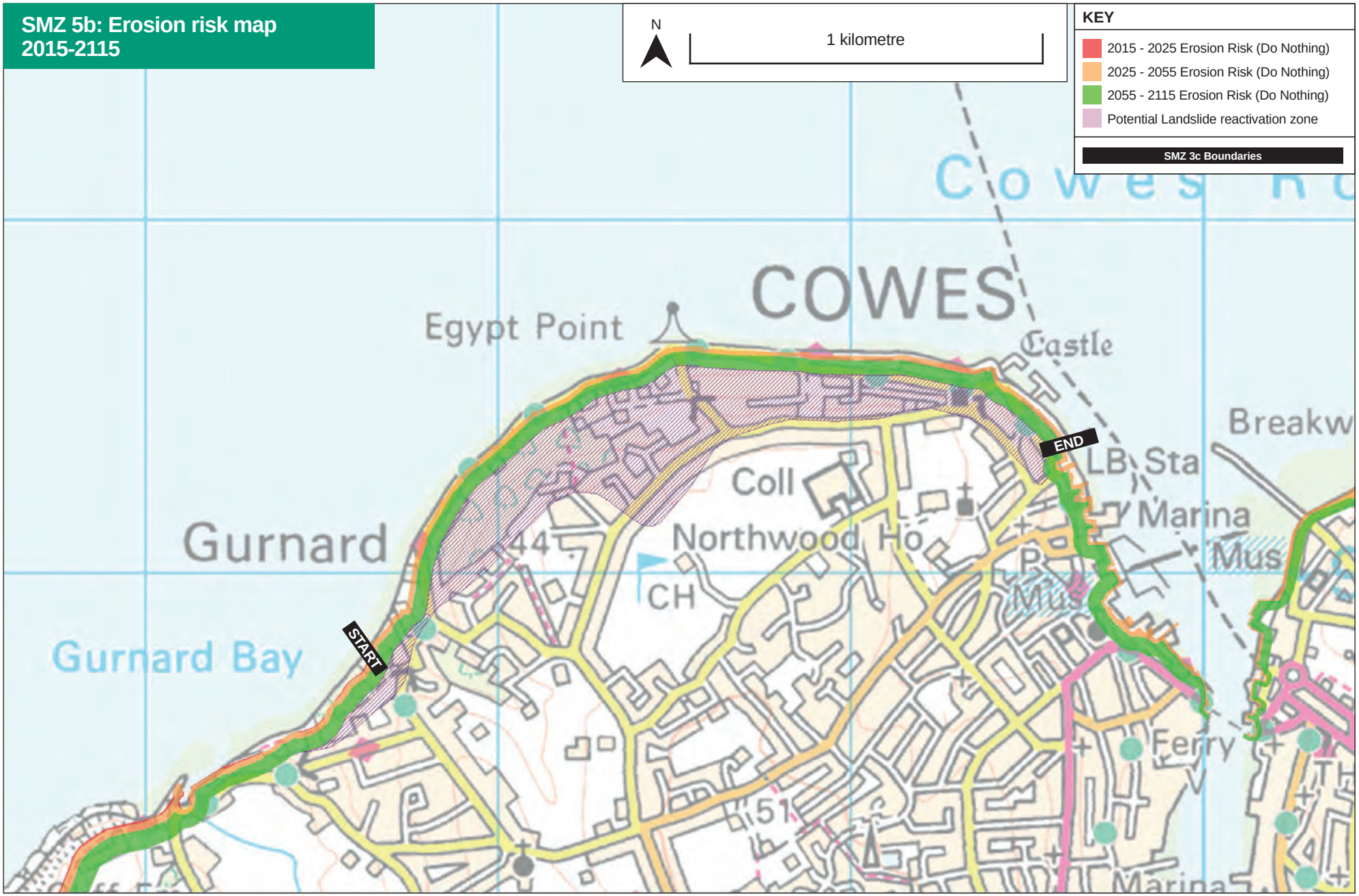
Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 5b: Baseline flood risk map 2115



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 5b: Erosion risk map 2015-2115



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

Whilst there is localised flood risk along this frontage, the more significant risk is erosion and landslide reactivation, especially in the longer term. Over the next 100 years 269 properties are expected to be at risk from erosion. In addition, there are another 247 properties at risk over the same period as they are within the area of potential landslide reactivation. The management intent is therefore to protect property as well as the Queens Road, Prince's Road, Egypt Esplanade and other access roads as well as the Cowes promenade. Potential options to maintain, upgrade or improve the seawall and cliff stabilisation measures have been considered when developing options in this area. The costs of these options in relation to the benefit that these options would deliver were explored.

The preferred option is to maintain protection through a programme of maintenance and capital refurbishments of the sea wall defences to help prevent erosion and re-activation of relict landslips. The defences are an integral aspect helping to maintain the stability of the coastal slopes in this area as they prevent wave action and coastal processes from eroding the base of the slopes. It should be noted that under the preferred option the localised flood risk, mainly to the road and promenade areas (from wave overtopping in storm events) will increase over time as crest heights will not be actively raised given the scale of cost that would be involved when there is minimal flood risk to residential properties.

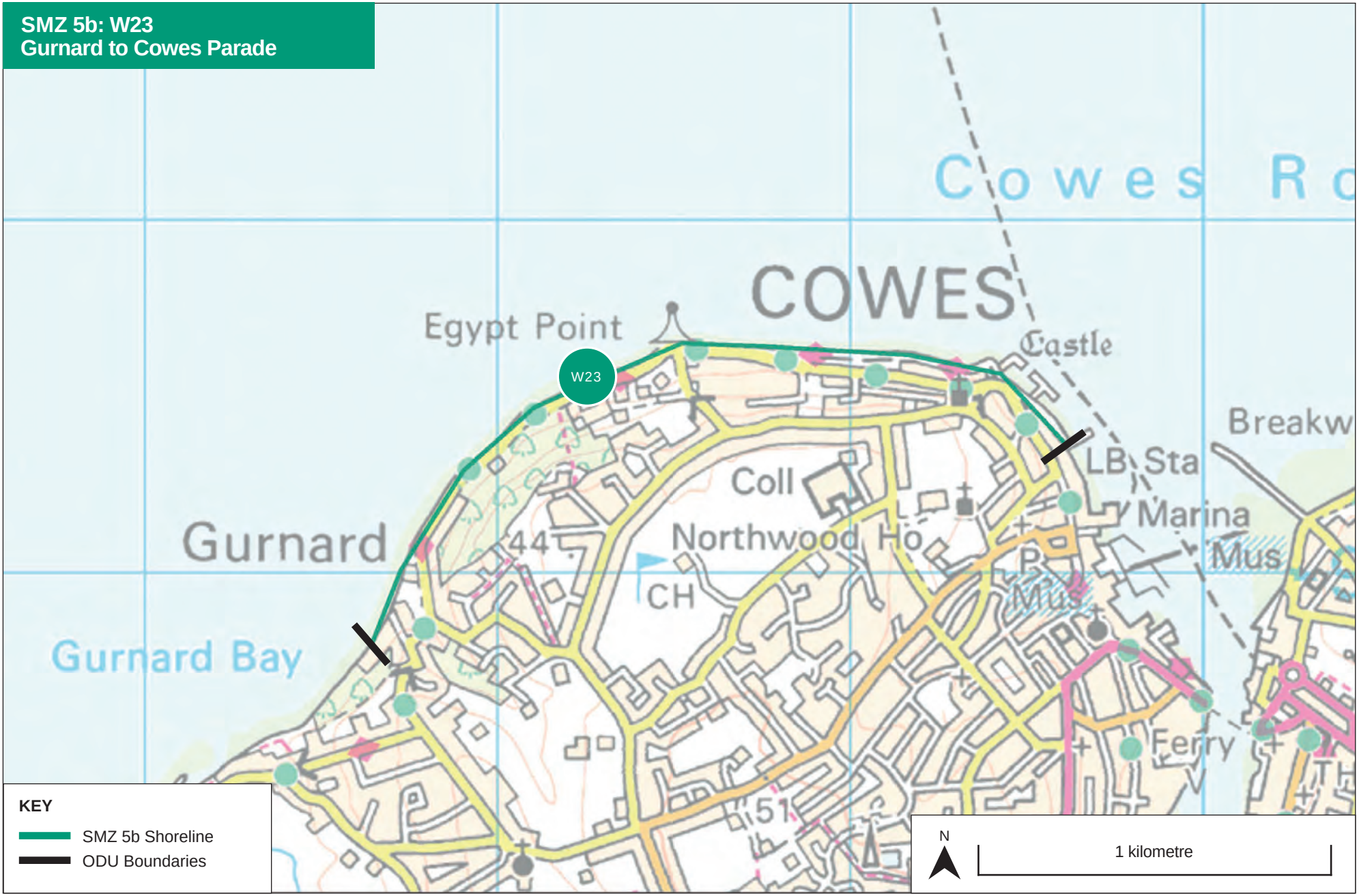
Given the variable condition of the seawall, it is likely that sections of the wall will require an initial capital refurbishment or replacement scheme in 15 years, with further period interventions thereafter.

At Shore Path in Gurnard, at the western end of this frontage, privately funded maintenance of existing defences will be permitted, subject to gaining the required consents.

The present value (PV) cost of the preferred option in SMZ 5b is approximately £3.6million (approximately £12.4million in cash terms). There is likely to be partial government Grant in Aid (GiA) funding for these works. It is intended that the Isle of Wight Council (IWC) will continue work to explore potential future funding options and opportunities, possibly through delivering in partnership with other services on the Island and the local community and businesses, to maintain the defences and prevent erosion risk to this part of Cowes and Gurnard.

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal



ODU W23 boundaries in SMZ5b

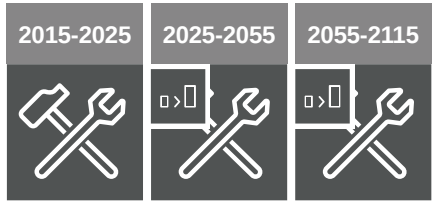
SMZ 5b Preferred Strategic Option: Maintain protection through a programme of maintenance and capital refurbishment works to the sea wall to prevent erosion and re-activation of relict landslips.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£3,641,000	£23,551,000	6.5 : 1

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W23 Gurnard to Cowes Parade



Programme of maintenance and refurbishment works to the existing seawall to prevent failure and erosion but accept flood risk (from wave overtopping) will increase over time. Given the variable condition of the seawall it is likely that sections of the defence will require an initial capital refurbishment or replacement scheme in 15 years with a further period of intervention thereafter. There is likely to be partial GiA funding towards the cost of these works. Contributions will also be required to form part of the funding to implement the preferred option. At the western end of this frontage, privately funded maintenance of existing private defences will be permitted, subject to gaining the required consents.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

Aerial view over Cowes

SMZ 6

Cowes, East Cowes and the Medina

Cowes Parade to Old Castle Point, East Cowes

SMZ 6a

Cowes and East Cowes

Strategy Management Zone 6a (SMZ 6a) includes the town centres of Cowes and East Cowes.

Shoreline Management Policy (2011): The policy in this strategic zone is 'Hold the Line'. This policy promotes the maintenance of existing defences and implementation of new defences to manage flooding and erosion risks.

Land Use: This area is a key urban area for the island. These frontages contain a large number of residential and commercial properties and industrial facilities that utilise waterfront access. There are a number of wharfs and marinas, including ferry terminals in Cowes and East Cowes.

Coastal Processes: A section of this frontage is on the open coast but is relatively sheltered from larger waves. The strategic area extends south into the developed areas lining the mouth of the sheltered River Medina.

Environment: The majority of the coastline of this area is developed but is designated as a Special Area of Conservation. There are conservation areas in Cowes and at East Cowes (centre and esplanade) and a number of listed buildings.

Coastal Defences: The majority of this strategic zone is defended with concrete/masonry/sheet piled walls in generally fair to very good condition. The need for waterfront access means that a number of concrete slipways are present. The esplanade wall at Cowes Parade is a Grade II* Listed Building. Also, the Shrape Breakwater and the newly constructed Outer Breakwater provide shelter to maritime operations in the Medina.

Flood and Erosion Risk: There are significant flood risks in this area and the extent and severity of this risk will increase over time as a result of sea level rise. A slow but ongoing erosion risk exists to the frontage, if existing structures fail. These risks are significant because of the large amount of properties in close proximity to the waterline.

Wider stakeholder aspirations: Redevelopment and regeneration, coastal flood and erosion protection and improve coastal access in Cowes and East Cowes.

Baseline – what would happen if we did nothing?
Under a 'No Active Intervention' scenario there would be significant levels of flood and erosion risks over the next 100 years. Tidal flooding has recently been observed in the area and the frequency of such events is expected to increase in the future due to climate change. A large amount of residential and commercial properties are at risk. If the structures lining the waterfront fail there will be an ongoing threat of erosion to assets including a large number of commercial properties. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table overleaf.

Today there are 317 properties at risk of flooding from a 1:200 year (0.5% annual chance) event, by 2115 there would be a total of 423 properties at risk from tidal flooding. By 2055 there would be a total of 98 properties at risk of erosion, by 2115 a total of 333 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	122	131	137	195
Commercial	195	214	235	228
Total	**317**	**345**	**372**	**423**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2030**	**2055**	**2115**
Residental & Commercial	0	0	98	333

Properties at risk of erosion.

By 2115 the total damages in SMZ 6a would be expected to reach over £92million.

The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

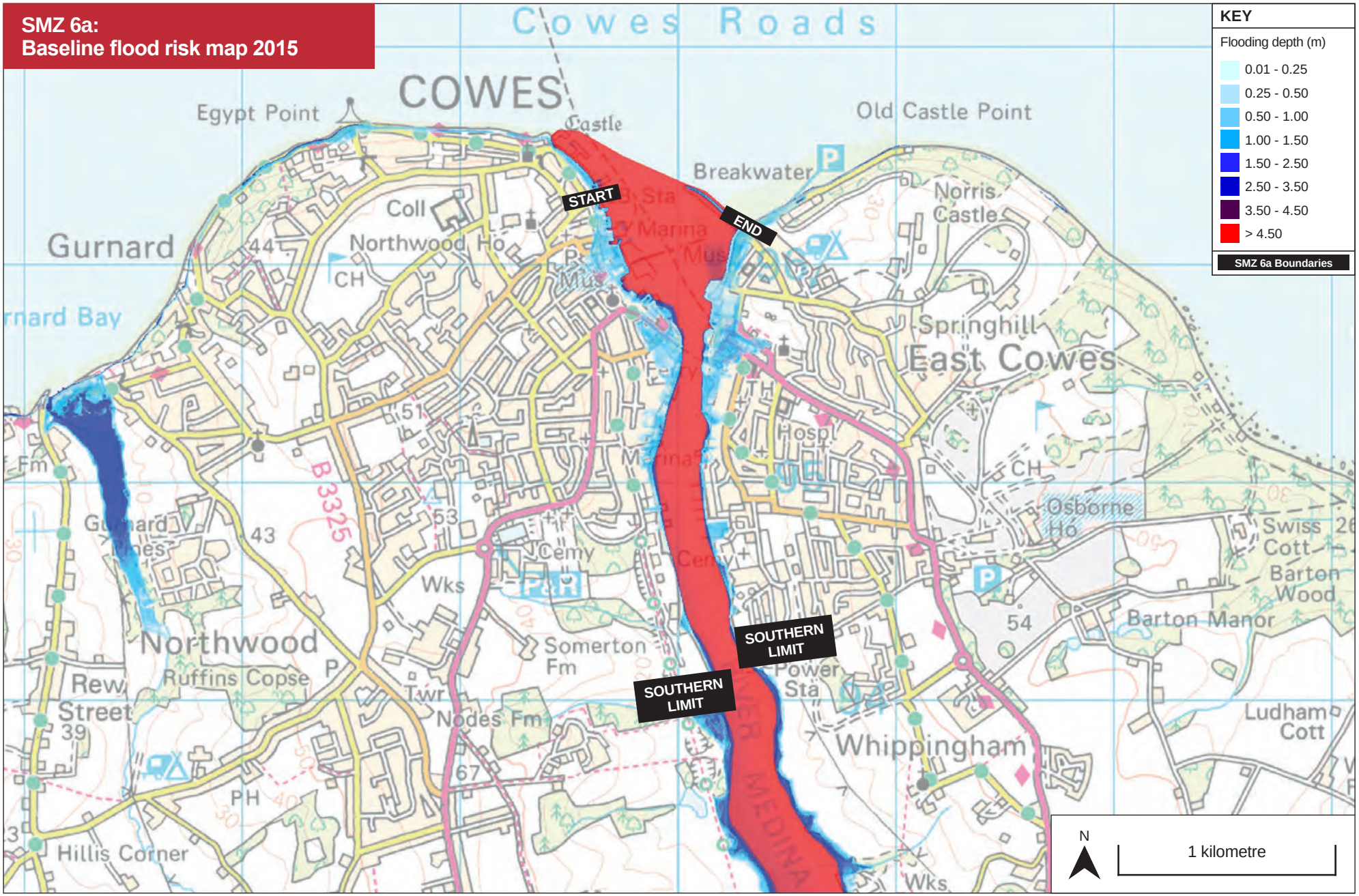
Type of damage	PV cost of damage*
Direct flood damages	£55.7M
Direct erosion damages	£12.9M
Indirect damages (e.g. health)	£24.1M
Total	**£92.6M**

SMZ 6a whole life (100 year) do nothing damages (present value - £M)

Cowes High Street

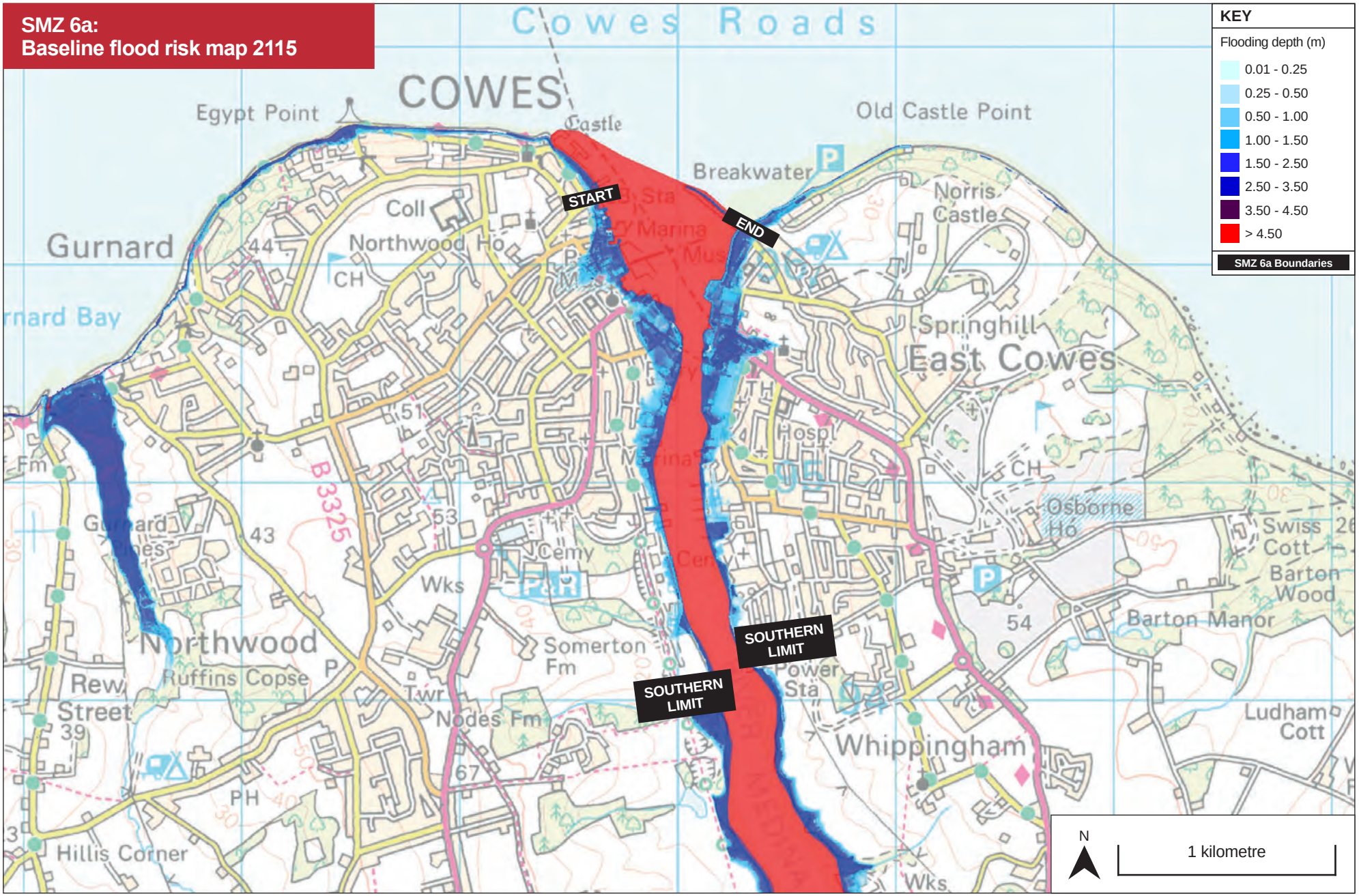
*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

SMZ 6a:
Baseline flood risk map 2015



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

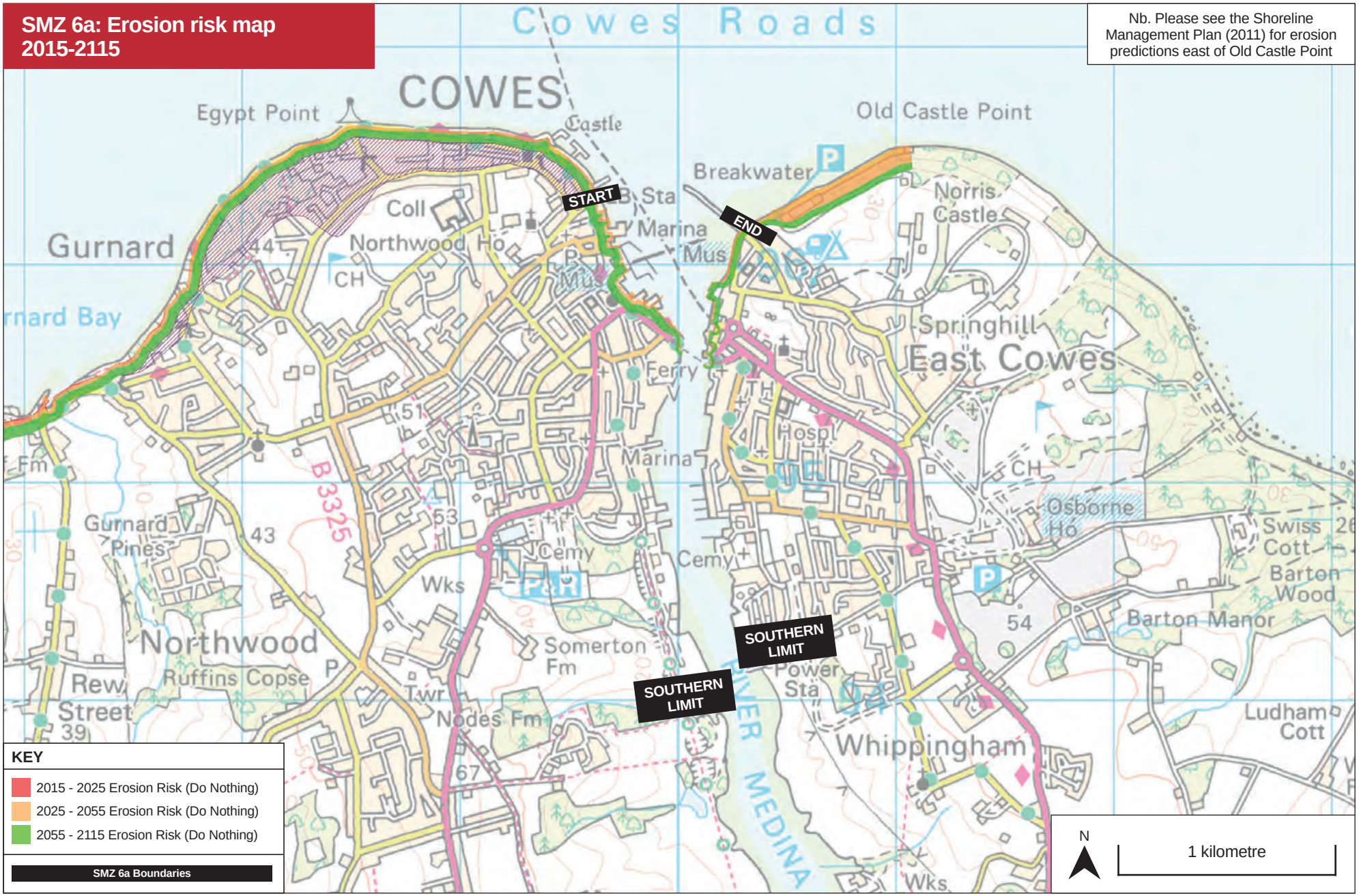
SMZ 6a: Baseline flood risk map 2115



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 6a: Erosion risk map 2015-2115

Nb. Please see the Shoreline Management Plan (2011) for erosion predictions east of Old Castle Point



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

There is significant tidal flood risk affecting commercial and residential properties in parts of Cowes and East Cowes. In the future this flood risk is expected to increase in severity and extent due to climate change and sea level rise, which will also increase the potential of erosion along the coastal frontage.

The preferred option recognises the need to reduce flood risk, but the government Grant in Aid monies available for a scheme at Cowes are modest. Despite experiencing several flood events raising awareness of the risks, the significant contributions that would be required to implement a more ambitious scheme are not currently available.

The preferred option is to use a combination of temporary flood barriers and property level protection to reduce the impacts of tidal flooding in the short to medium term (up to 2055). There is a range of industry approved commercially available barriers which could be utilised. Typically these systems comprise of interlocking units which can be stored locally then manually deployed prior to an event by trained personnel. The units require no permanent fixing to the ground but would require ongoing maintenance and upkeep. To ensure the barriers are effective, their deployment will need to be linked to a tide event flood warning system. **Private ongoing maintenance and raising of coastal structures along the seafront is also required to prevent the risk of erosion and to help address flood risk (subject to gaining the necessary consents).**

In the short to medium term there is a high likelihood of securing a high proportion of government Grant in Aid (GiA) funding for the temporary barriers and property level protection for residential properties at very significant risk.

However, additional contributions will also be required. The Isle of Wight Council will seek funding for these short term schemes. The temporary flood defences will not address flood risk in all areas, so residents and businesses should continue to take action to mitigate the impact of flood events on their properties and businesses.

In the longer term as the risk to properties becomes greater, the preferred option is to improve protection through raising or replacing existing quay walls and implementing new frontline (or setback) flood defences. However, this is a very costly option and significant non Grant in Aid funding will need to be secured. This longer term option would ensure the continued viability of the town and reduce flood risk to people and property, and the IWC will continue to explore funding options. The community however should remain aware of the long term increasing flood risks.

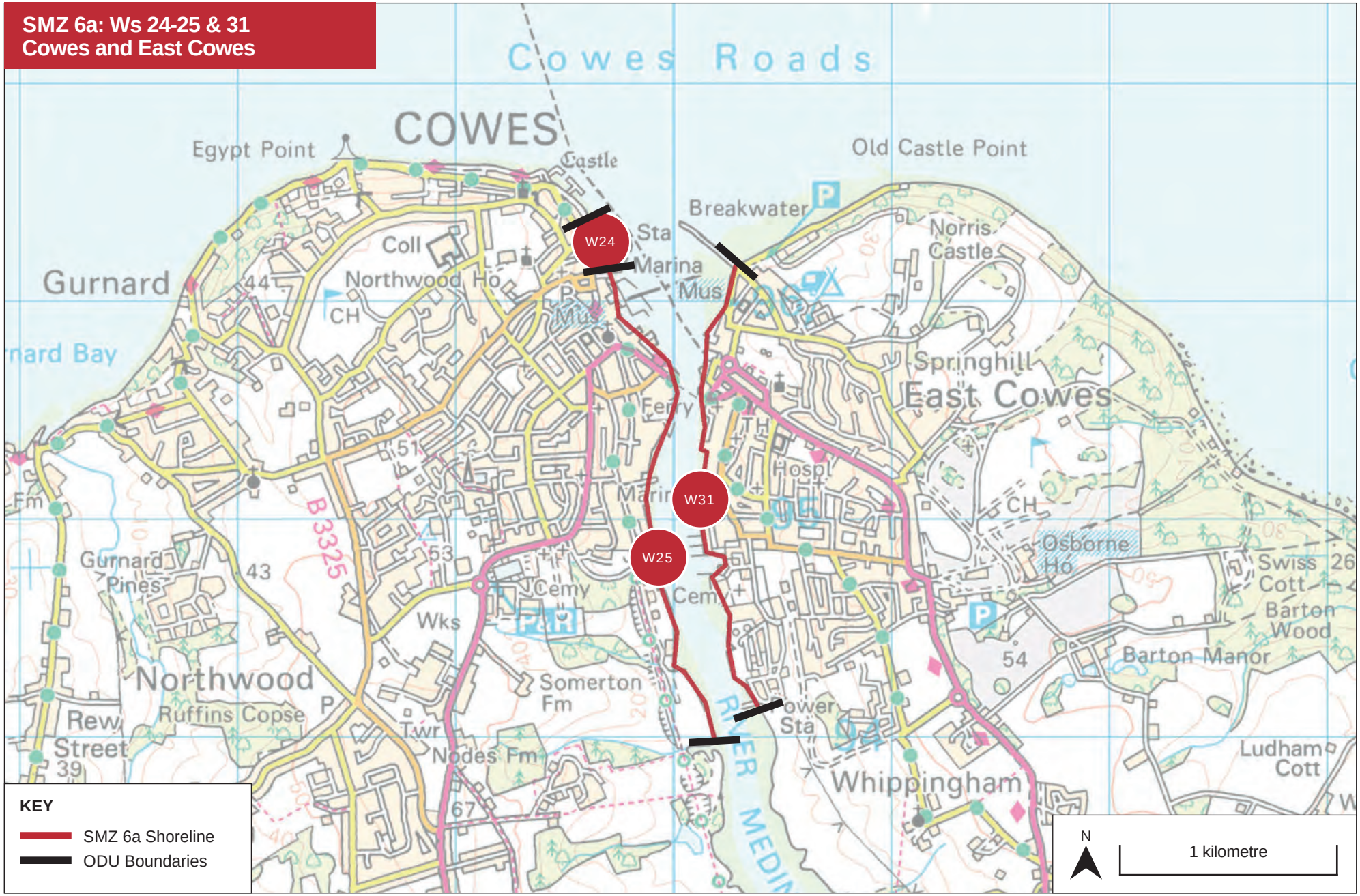
A key part of reducing the funding shortfall and reducing flood risk in the town will be to gain contributions through redevelopment. Through the planning process development within the flood zone or along the coastal edge should contribute not only to reducing site flood risk, but also towards the longer term strategic management of flood risk through raising ground levels or improving defences.

The Present Value (PV) cost of the preferred option at SMZ 6a is approximately £19.4million (approximately £63.5million in cash terms).

The Cowes and East Cowes waterfronts are lined by a series of properties and businesses reliant on their waterfront locations. This Strategy promotes action by the Risk Management Authorities to reduce risk in key areas in the short and medium term. However, all waterfront landowners should take steps to reduce the impact of flooding on their own property and on adjacent properties.

The preferred options, and areas benefiting have been mapped and are provided on pages 140-141.

For further details, refer to Appendix J: Option Development and Appraisal



ODU W24-25 and 31 boundaries in SMZ 6a

SMZ 6a Preferred Strategic Option: In the short and medium term maintain the existing defences and use Temporary Flood Barriers and Property Level Protection to sustain a 1 in 75 year SoP in the areas at significant risk. Use redevelopment opportunities to facilitate the raising / implementation of new strategic defences. In the long term (from 2055) implement new defences such as seawalls or setback floodwalls to manage the increase in flood and erosion risk posed by sea level rise.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£19,356,000	£57,776,000	3.0 : 1

KEY

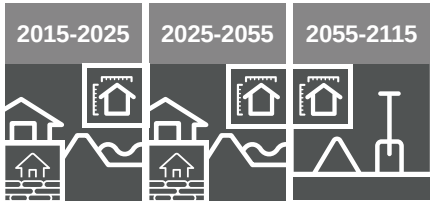
Do Nothing
Property Level Protection
Environmental mitigation/ habitat creation
Upgrade/ Refurbishment
Adaptation / Coastal Change Management Area
Temporary flood barriers
Maintenance
Capital Works
Maintain access/ Health & Safety
Developers provide new defences

W24 West Cowes (north)

Reduce tidal flood risk through a property level protection (PLP) and community flood warning scheme. Private ongoing maintenance and upgrading of coastal structures along the seafront is also required to prevent the risk of erosion and help to address the risk of flooding**. A high proportion of GiA funding is likely for PLP for residential properties at very significant risk. Redevelopment / change of use opportunities to raise land levels or provide defences to reduce longer term flood risk. Longer term funding for new defences will need to come mainly from non GiA sources.

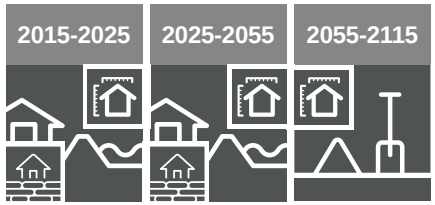
** Subject to gaining the necessary consents

W25 West Cowes (centre and south)



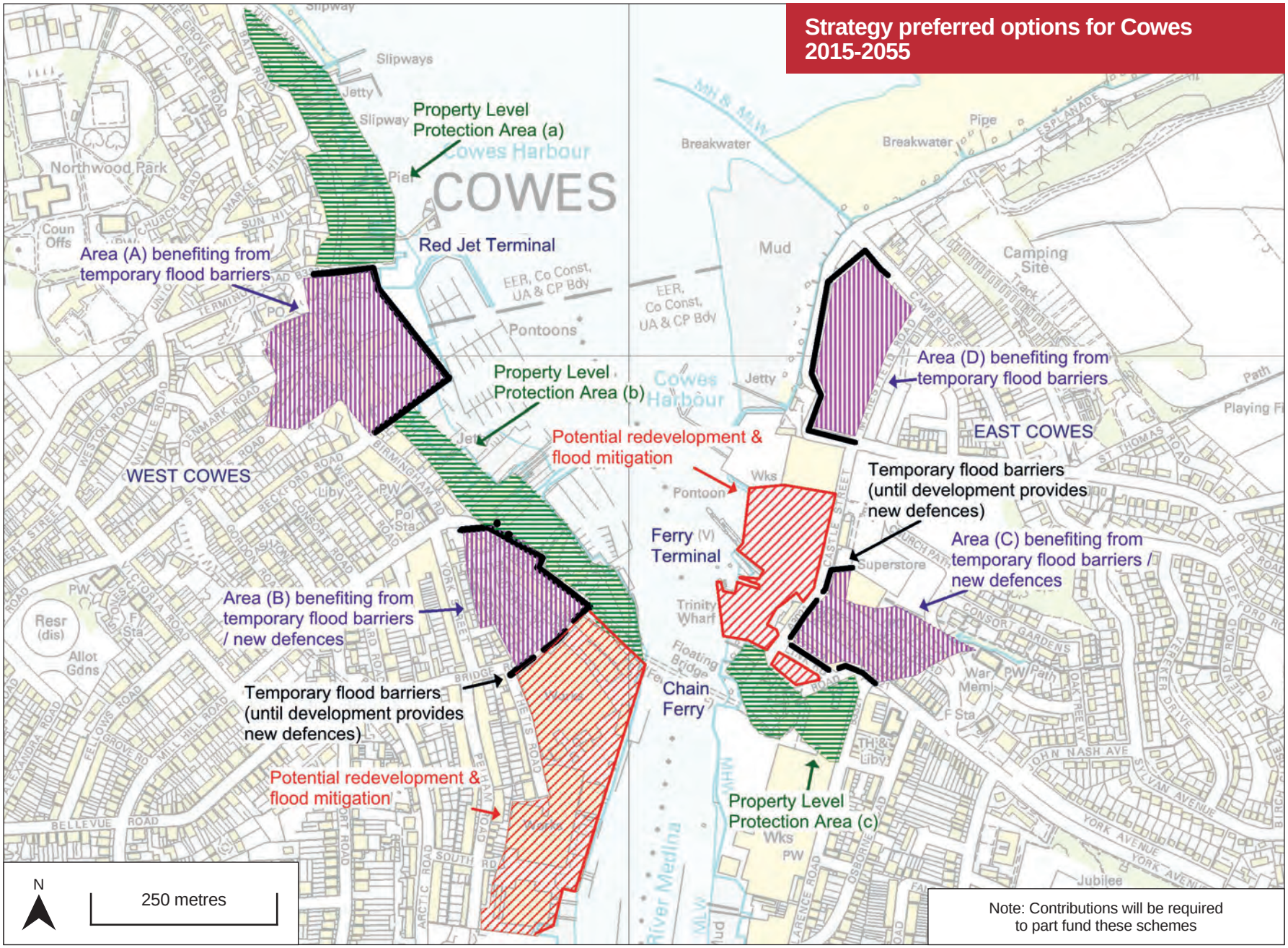
Reduce tidal flood risk to the areas at highest risk in the short and medium term through property level protection and temporary barriers linked to a community flood warning scheme. A high proportion of GiA funding is likely for temporary barriers and PLP for residential properties at very significant risk. Private maintenance and upgrading of defences is also recommended**. Longer term funding for new defences will need to come mainly from non GiA sources. Redevelopment / change of use opportunities to raise land levels or provide defences to reduce longer term flood risk, and contribute to strategic defences.

W31 East Cowes

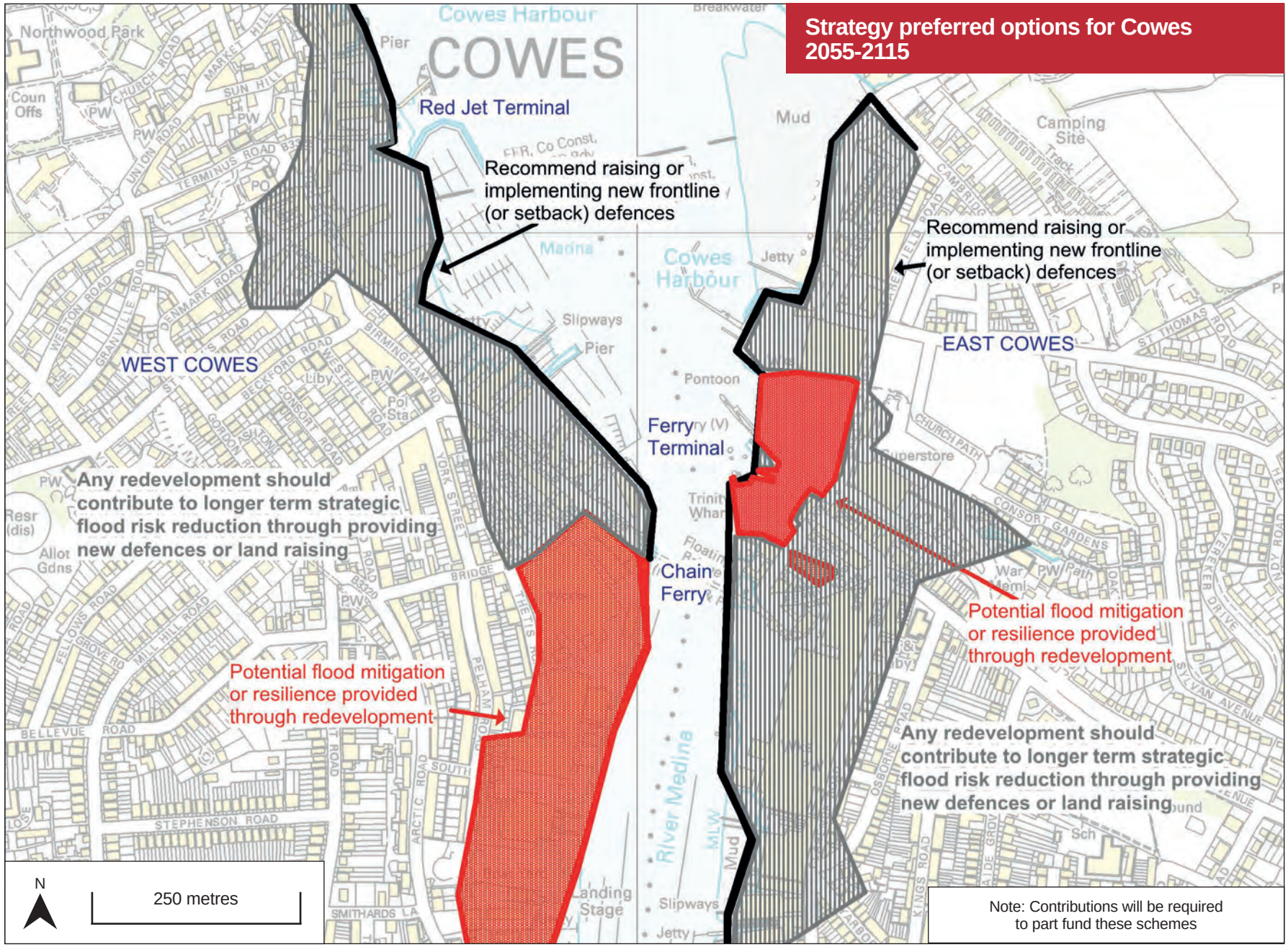


Reduce tidal flood risk to the areas at highest risk in the short and medium term through property level protection and temporary barriers linked to a community flood warning scheme. A high proportion of GiA funding is likely for temporary barriers and for PLP for residential properties at very significant risk. Private maintenance and upgrading of defences is also recommended**. In the longer term raise frontline defences and setback defences to address long term flooding and erosion risks. Longer term funding for new defences will need to come mainly from non GiA sources. Redevelopment / change of use opportunities to raise land levels or provide defences to reduce longer term flood risk, and contribute to strategic defences.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.



Short to medium term preferred options for Cowes



Longer term preferred option for Cowes

SMZ 6b

Medina Estuary (and East Cowes Outer Esplande)

Strategy Management Zone 6b (SMZ 6b) includes both sides of the River Medina (from south of Cowes to north of Newport) and also East Cowes outer esplanade (from the Shrape breakwater to Old Castle Point).

Shoreline Management Policy (2011): The policy for SMZ 6b is predominantly 'No Active Intervention', to allow the Estuary to adapt naturally to sea level rise. This policy promotes no planned investment in defending against flooding or erosion, whether or not a coastal defence has existed previously. The only area where this differs is West Medina Mills where the policy is 'Hold the Line'. A 'Hold the Line' policy supports the maintenance of existing defences and implementation of new defences to manage flooding and erosion risks. From the Shrape Breakwater to Old Castle Point there is a 'Hold the Line' policy to 2025, then it transfers to a policy of 'No Active Intervention'.

Land Use: Most of this strategic zone is open space and farmland or recreational land along the riversides. There are a few isolated residential properties and small industrial areas such as West Medina Mills.

Coastal Processes: This area is mostly within the sheltered River Medina. From Shrape Breakwater to Old Castle Point the coast is relatively sheltered from waves, being situated within the Solent. There have been small landslides in this location, the most recent being a slump from the coastal slope onto the road in April 2014.

Environment: The River Medina runs through this SMZ which is covered by a number of environmental designations including a Special Area of Conservation, Ramsar, Special Protection Area, Site of Special Scientific Interest.

Coastal Defences: The majority of this strategic zone is undefended. There are small sections of defences present such as a private steel sheet piled wall at West Medina Mills and a concrete wall between Shrape Breakwater and Old Castle Point which is in fair to good condition.

Flood and Erosion Risk: There are a few properties at risk from flooding in this strategic zone. The properties are well dispersed along this long frontage. There are a few properties at risk from erosion between Shrape Breakwater and Old Castle Point in the longer term.

Wider stakeholder aspirations: Maintain natural environment, maintain access to footpaths.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario there would be low levels of flood and erosion risks over the next 100 years over this long, largely undeveloped frontage. The flooding of properties will increase over time due to climate change. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table overleaf.

Today there are 13 properties at risk of flooding from a 1:200 year (0.5% annual chance) event, by 2115 there would be a total of 61 properties at risk from tidal flooding. By 2115 a total of 9 properties would be at risk from erosion.

	Time Horizons			
Properties at risk from flooding▾	**2015**	**2025**	**2055**	**2115**
Residential	4	6	16	43
Commercial	9	9	12	18
Total	**13**	**15**	**28**	**61**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

	Time Horizons			
Properties at risk from erosion▾	**2015**	**2030**	**2055**	**2115**
Residental & Commercial	0	0	4	9

Properties at risk of erosion.

By 2115 the total damages in SMZ 6b would be expected to reach £2.6million.

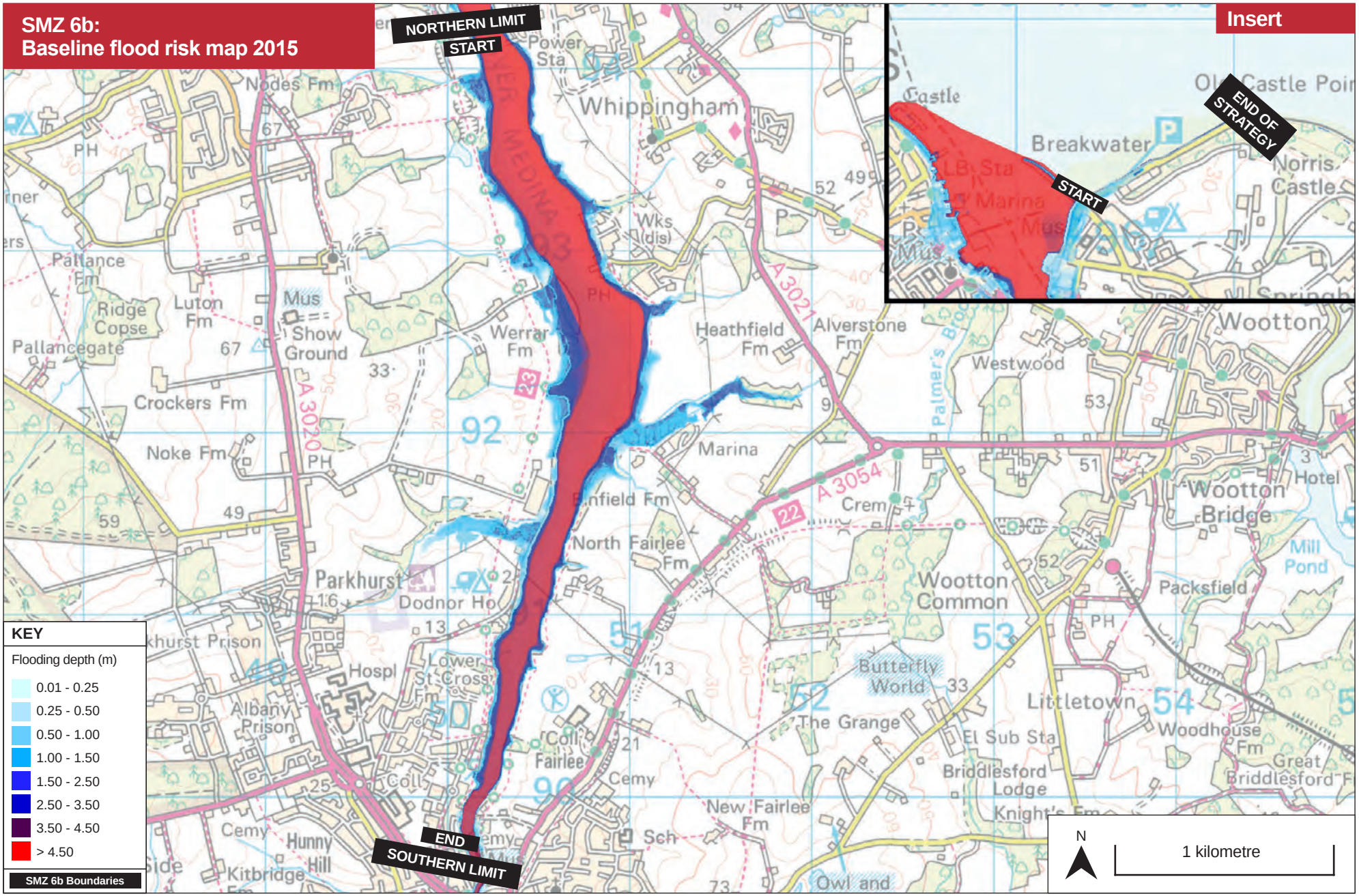
The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£1.8M
Direct erosion damages	£0.1M
Indirect damages (e.g. health)	£0.7M
Total	**£2.6M**

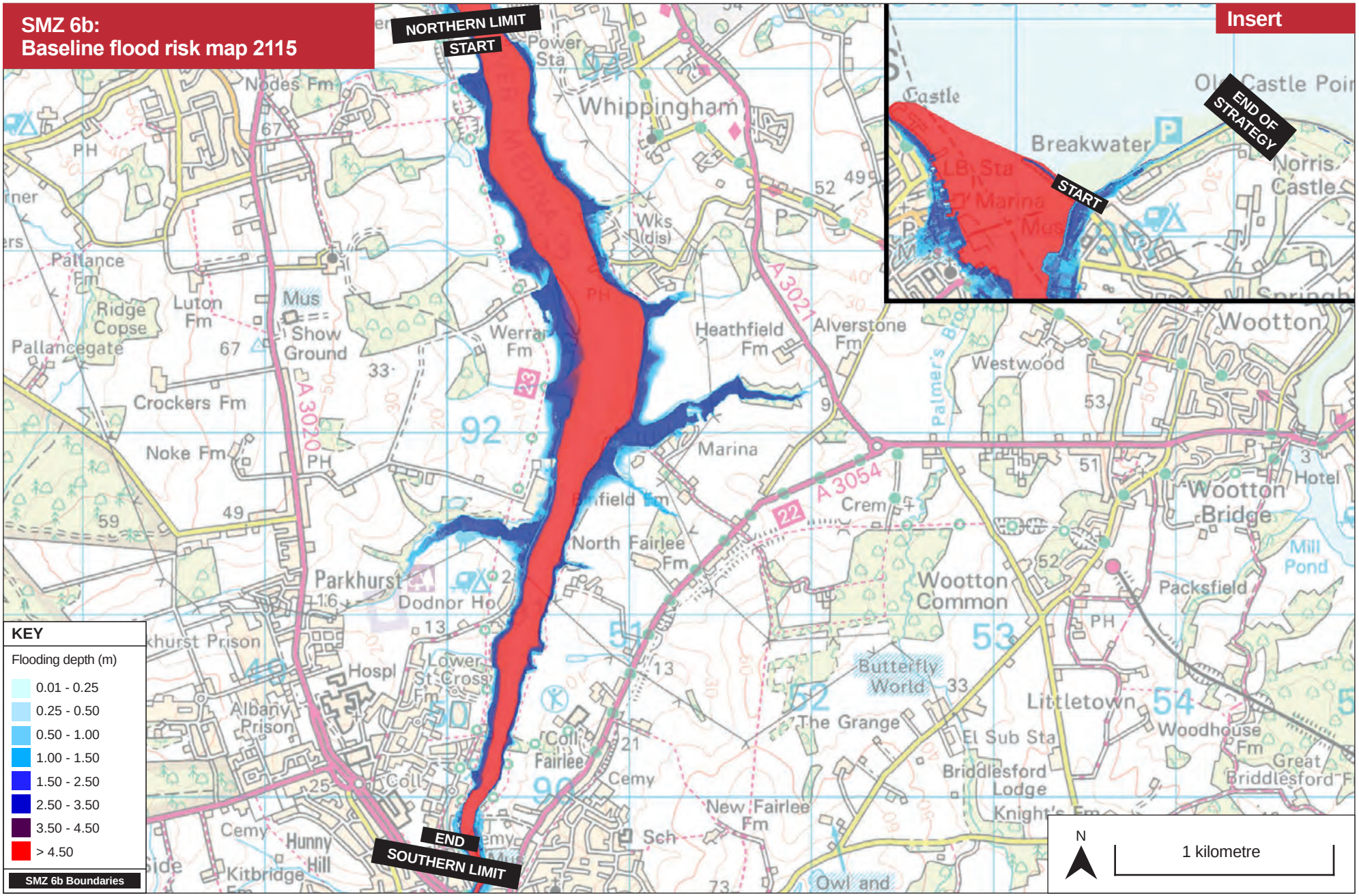
SMZ 6b whole life (100 year) do nothing damages (present value - £M)

Calm waters of the Medina

*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

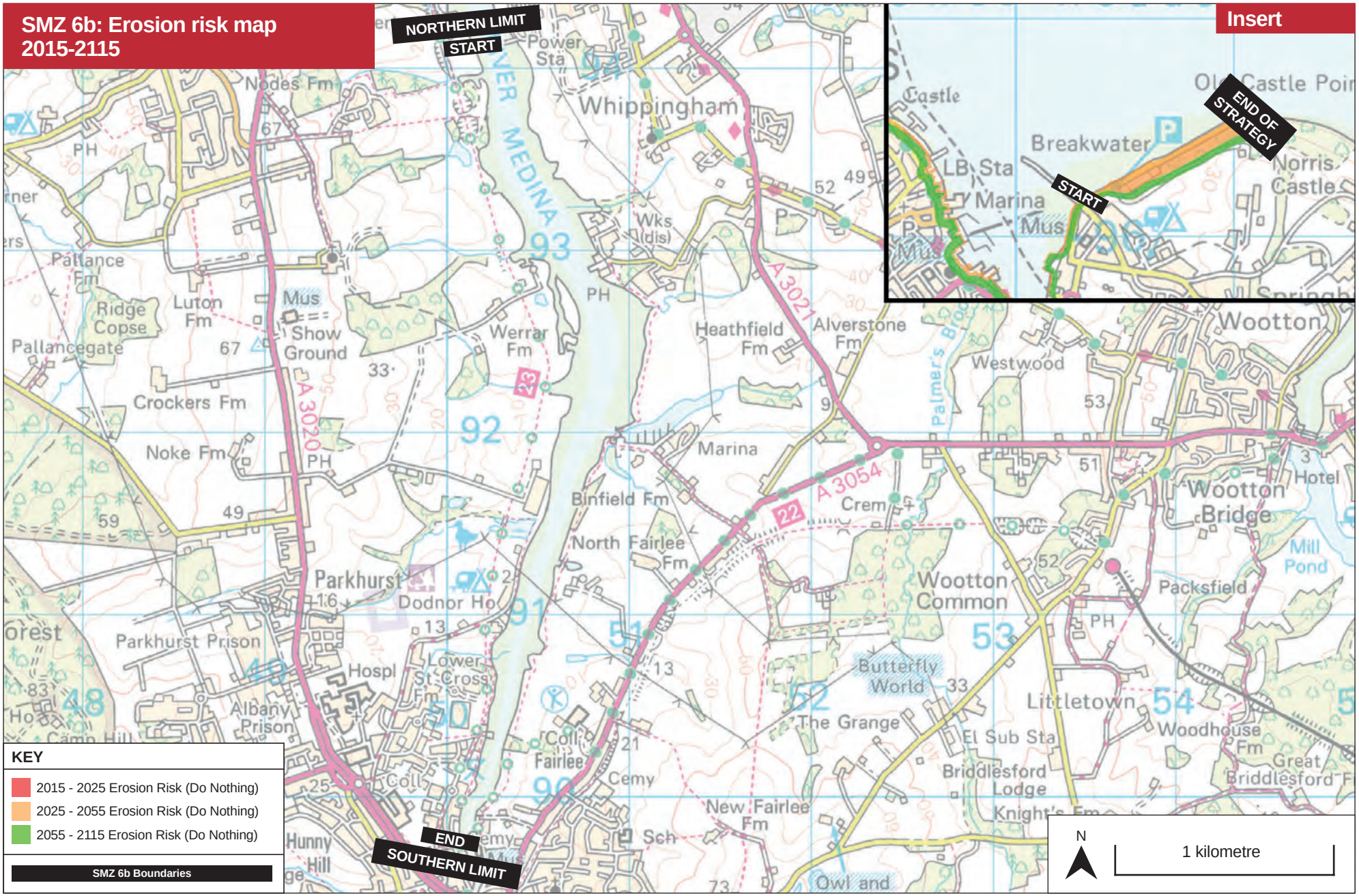


Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 6b: Erosion risk map 2015-2115



Indicative erosion risk zones under a 'Do Nothing' scenario

Strategy preferred option - commentary

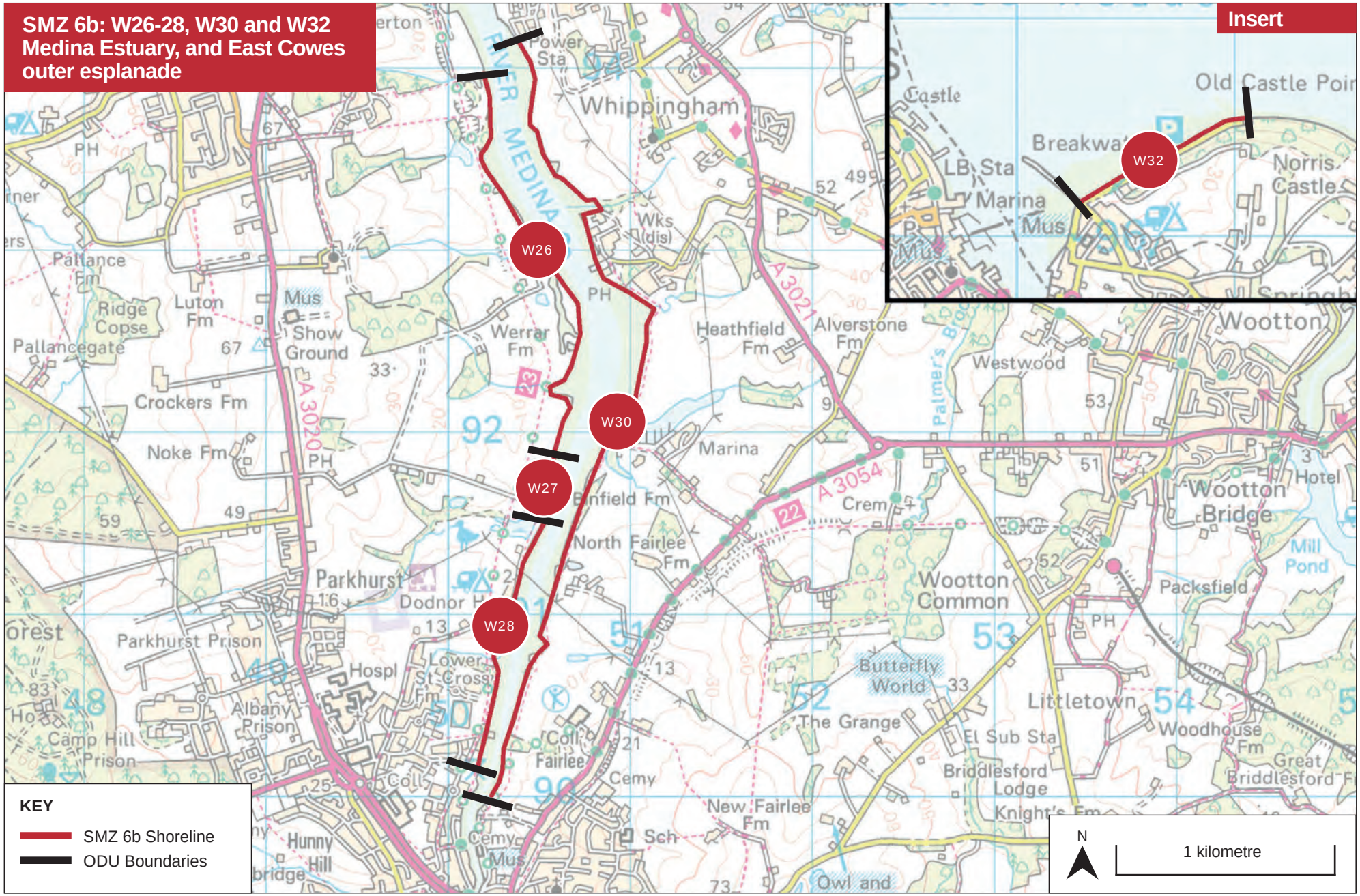
In this largely undefended and sheltered estuarine area, **there is no planned publically funded maintenance or investment in coastal defences.** This will mean this part of the Medina continues to evolve largely through natural processes. An exception to this will be West Medina Mills, where privately funded defence upgrades will be permitted (subject to obtaining the necessary consents).

It is recognised that **local erosion risks to businesses, people and coastal footpaths will need to be mitigated or adapted to, and therefore privately funded maintenance of existing coastal infrastructure or defences will be permitted (subject to gaining the necessary consents). Privately funded property level protection is recommended for the small number of properties that are at significant risk of flooding.**

At East Cowes outer esplanade the preferred option is to continue minor maintenance to the seawall in the short term, but in the long term there are not enough properties at risk in this area to justify replacement of the seawall (as outlined in the SMP in 2011).

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal



ODU W26-28, 30 and 32 boundaries in SMZ 6b

SMZ 6b Preferred Strategic Option: Within the Medina, no planned maintenance or intervention (with the exception of West Medina Mills). Privately funded maintenance of existing assets and property level protection permitted (subject to gaining the necessary consents). At East Cowes outer esplanade, minor maintenance of the existing seawall, transferring to do nothing in the longer term.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£62,000	£0	N/A

KEY

Do Nothing | Property Level Protection | Environmental mitigation/ habitat creation | Upgrade/ Refurbishment | Adaptation / Coastal Change Management Area

Temporary flood barriers | Maintenance | Capital Works | Maintain access/ Health & Safety | Developers provide new defences

W26-28 & W30 Central Medina

No planned maintenance or intervention. Privately funded maintenance of existing assets permitted (subject to gaining the necessary consents).

An exception to this is W27 - West Medina Mills, where privately funded defence upgrades will also be permitted (subject to gaining the necessary consents).

W32 Shrape Breakwater to Old Castle Point

In the short term the preferred approach is to continue minor maintenance to extend the residual life of the seawall where achievable (especially at the western end of the unit). Larger maintenance needs however will be assessed on a case by case basis, to determine what is affordable. There are not sufficient residential properties in this area to justify continued defence and therefore when the current structures reach the end of their life, there are no proposals to replace them in the medium or long term. Only required health and safety measures will be undertaken, and erosion risk will increase as the coastline begins to evolve naturally.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

SMZ 6c

Newport Harbour

Strategy Management Zone 6c (SMZ 6c) covers Newport Harbour.

Shoreline Management Policy (2011): The policy for SMZ 6c is predominantly 'Hold the Line'. This policy promotes the maintenance of existing defences and implementation of new defences to manage flooding and erosion risks.

Land Use: This strategic zone has commercial properties, industrial facilities and residential properties close to the waterfront. There is also a tidal harbour.

Coastal Processes: This area is within the sheltered River Medina and tidal flows dominating.

Environment: This SMZ does not contain any nature conservation designations. There are historic environment designations in the form of several Listed Buildings (including the slipway and part of the quay wall), the Newport Conservation Area, and parts of the quay walls which are historic structures.

Coastal Defences: The vast majority of this strategic zone is defended. Typically defences consist of masonry/concrete/steel sheet piled walls in generally fair to good condition.

Flood and Erosion Risk: There are a number of mainly commercial properties close to the waterfront that are at risk of flooding. The flood zone does not extend very far from the defences because of the rising topography of this area. The properties that flood are not concentrated in one location, rather they are spread out over this strategic zone. If the harbour walls were allowed to fail a number of properties in close proximity could be at risk of erosion.

Wider stakeholder aspirations: Improve coastal flood and erosion protection, redevelopment and regeneration in Newport.

Baseline – what would happen if we did nothing?

Under a 'No Active Intervention' scenario there would be a number of properties that are at risk from flooding and erosion over the next 100 years. The flooding of properties will increase over time due to climate change. The harbour walls are expected to fail before 2055 under a 'No Active Intervention' scenario, which would put 29 properties at risk of also failing because of their close proximity. The number of properties that would be at risk from a 1:200 year flood event (which has a 0.5% chance of occurring in any year) are shown in the table overleaf.

Today there are 16 properties at risk of flooding from a 1:200 year (0.5% annual chance) event, by 2115 there would be a total of 30 properties at risk from tidal flooding. By 2115 a total of 39 properties would be at risk from erosion.

Properties at risk from flooding▾	Time Horizons 2015	2025	2055	2115
Residential	7	11	3	19
Commercial	9	11	3	11
Total	**16**	**22**	**6***	**30**

Properties at risk of flooding from a 1:200 year (0.5% annual chance) event between 2015 and 2115.

*Number of properties at risk of flooding reduces in the future despite rising sea levels as some of the properties at risk of flooding are lost due to erosion under a 'Do Nothing' Scenario.

Properties at risk from erosion▾	Time Horizons 2015	2025	2055	2115
Residental & Commercial	0	0	29	39

Properties at risk of erosion.

By 2115 the total damages in SMZ 6c would be expected to reach £5.6million.

The flood, erosion and indirect damages that could be expected if a policy of 'Do Nothing' was followed are presented in the table below.

Type of damage	PV cost of damage*
Direct flood damages	£2.1M
Direct erosion damages	£3.0M
Indirect damages (e.g. health)	£0.6M
Total	**£5.6M**

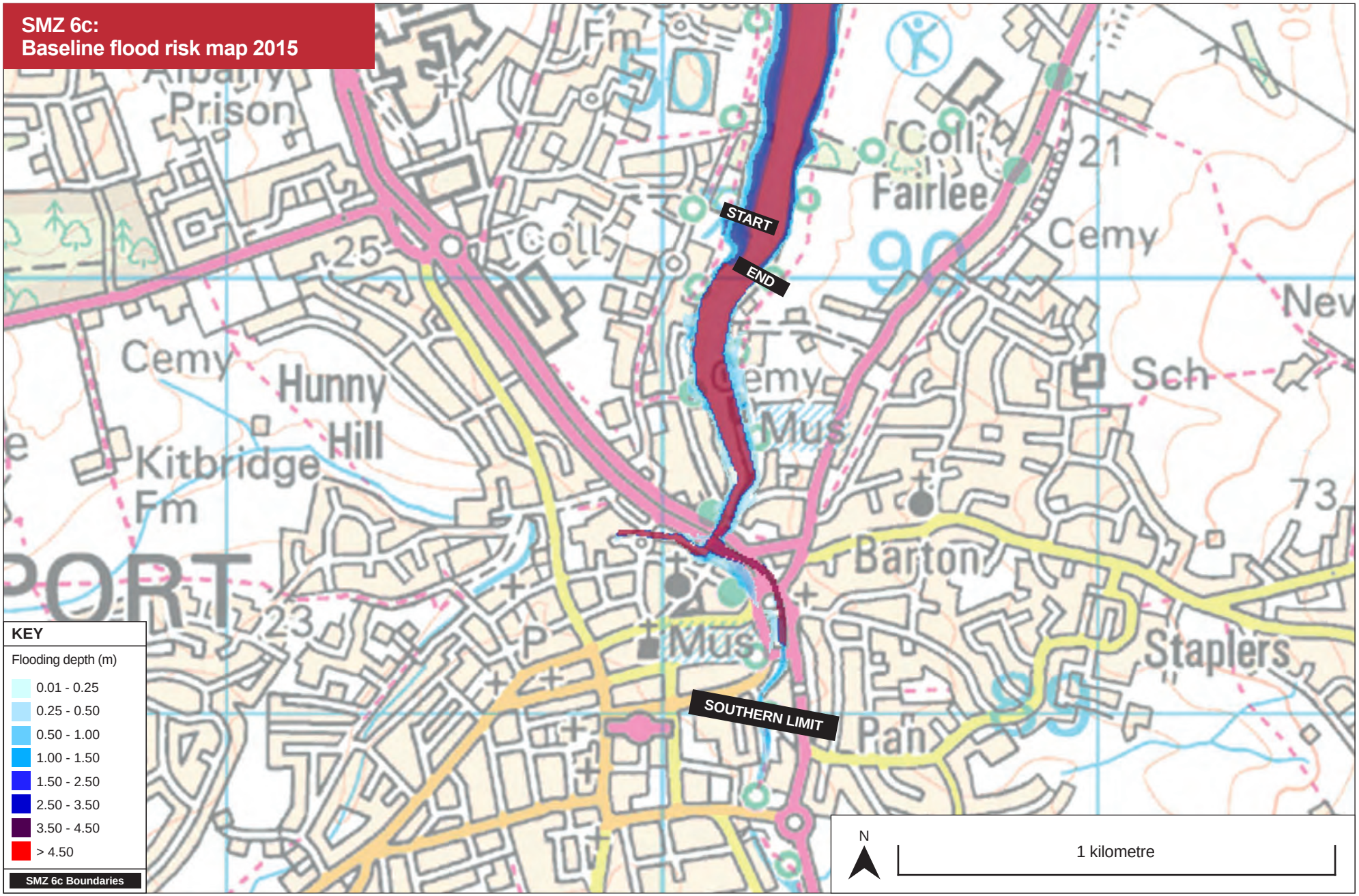
SMZ 6c whole life (100 year) do nothing damages (present value - £M)

Newport Harbour at high tide

Quay walls of Newport Harbour

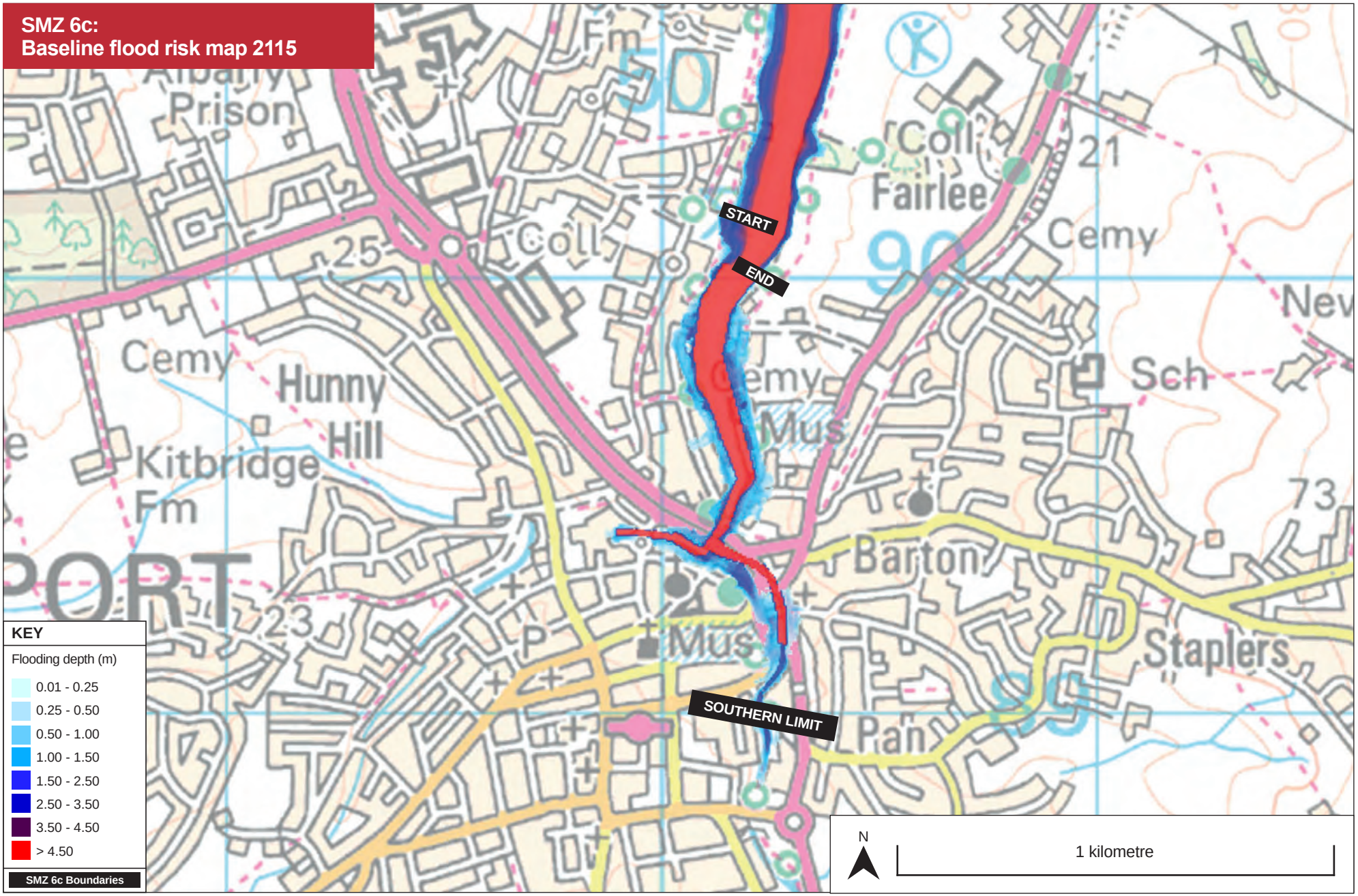
*note that damages are presented in Present Value (PV) terms (unless otherwise stated). PV describes the damages spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash damages will exceed the PV values presented.

SMZ 6c:
Baseline flood risk map 2015



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

SMZ 6c:
Baseline flood risk map 2115



Maximum potential flood depths from a 1:200 year (0.5% annual chance) event with existing defences in place

Newport Harbour

Strategy preferred option - commentary

There is flood risk to several commercial properties around the harbour and to a small number of nearby residential properties in Newport. In the short term tidal risk is localised, but over time, flood risk is expected to increase due to climate change and sea level rise, which will also increase the risk of collapse along the frontage given the age and condition of the existing harbour walls. The preferred option recognises the need to reduce flood risk, but the Grant in Aid monies available for a scheme at Newport are minimal. **The quay walls will need to be maintained by the asset owners to maximise the residual life of these defences. It is recommended that commercial and residential properties at significant risk implement and fund property level flood risk reduction and resilience measures.**

In the medium-long term, as the risk becomes greater, and the defences move towards the end of their service life, the preferred option is to refurbish and raise existing quay walls. However, this is a costly option (the Present Value (PV) cost of the preferred option at SMZ 6c is approximately £2million (approximately £7.8million in cash terms)), and non Grant in Aid funding will need to be secured. The Isle of Wight Council is seeking opportunities to implement this longer term option to reduce flood risk to people and property and to maintain the viability of the harbourside area, and will continue to explore funding options.

There is an opportunity to reduce the funding shortfall by gaining contributions through redevelopment. Through the planning process, development within the flood zone or along the waterside should not only reduce site flood risk, but also contribute towards the longer term strategic management of flood risk though improving defences or raising ground levels.

The preferred options are presented by ODUs in the following tables.

For further details, refer to Appendix J: Option Development and Appraisal

SMZ 6c: W29
Newport Harbour

ODU W29 boundaries in SMZ6c

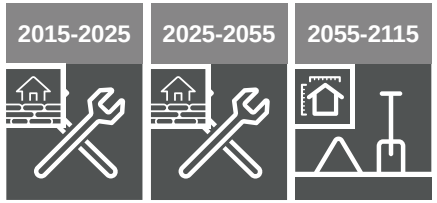
SMZ 6c Preferred Strategic Option: Maintain then refurbish existing defences once they reach the end of their service life. In the short term recommend Property Level Protection to manage and reduce flooding to areas at very significant risk. In the long term utilise redevelopment opportunities to facilitate the raising / implementation of new strategic defences to improve the standard of flood protection.

PV Cost*	PV Benefits*	Benefit:Cost ratio
£1,932,000	£3,292,000	1.7 : 1

KEY

- Do Nothing
- Property Level Protection
- Environmental mitigation/ habitat creation
- Upgrade/ Refurbishment
- Adaptation / Coastal Change Management Area
- Temporary flood barriers
- Maintenance
- Capital Works
- Maintain access/ Health & Safety
- Developers provide new defences

W29 Newport Harbour



Maintenance of quay walls is required by the asset owners to prevent deterioration. Refurbish and upgrade existing structures at the end of their service life (subject to gaining the necessary consents), then maintain these assets.

Recommend reducing tidal flood risk to a small number of properties through privately funded property level protection.

Longer term funding for new defences will need to come mainly from non GiA sources. Redevelopment / change of use opportunities to raise land levels or provide defences to reduce longer term flood risk and contribute to a strategic defence.

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

Totland landslip

funding

How will future management be funded?

Funding for coastal flood and erosion risk management in the UK

funding

How will future management be funded?

What do we want from you?

The Isle of Wight benefits from a long coastline and a legacy of past coastal defences. However, this wide range of communities at risk presents a challenge when trying to reduce and prioritise coastal risks in the future. Many of the seawalls and seafront promenades on West Wight have been constructed over many decades (through the past century) for a variety of reasons (sometimes for flood or coastal defence, others for amenity use, or road access for residents, or use by businesses, or footpaths, or private defences). The flood and coastal defence function alone is often not enough to secure their future. As these coastal structures age, risks increase, and rising sea levels place new areas at risk, which could also benefit from defences.

The West Wight Strategy has updated our understanding of the properties at risk along the coastline, examined how much it would cost to defend them (where appropriate) and assessed what funding sources would be required to take forward the priority schemes. It has also identified areas where adaptation to coastal risks will be required.

Until recently, gaining public funding for coastal defences was an all or nothing process. If a scheme was deemed worthy (in terms of the economic benefits it delivered) it would gain Environment Agency approval and would receive 100% public grant funding. Other schemes which were still viable, but were less economically beneficial, would fail to gain approval and would receive no funding. With a finite pot of money available to pay for schemes, it meant that some key defences were not being constructed.

In recent years (and since the Isle of Wight Shoreline Management Plan was produced) there has been a change in national approach to the way coastal defences get funding. The new system, referred to as a payment for outcomes approach, rewards the 'partnership funding' of schemes and provides many positive benefits with lots more schemes now being built as a result. The system encourages those benefiting from defence schemes to contribute to their cost.

Although the worthy schemes can still gain approval for 100% public funding (Grant in Aid), most schemes do not reach this threshold, and schemes with an external contribution are prioritised to attract public monies. In addition, the merits of a scheme are not judged purely on economic terms (Benefit: Cost); the wider outcomes that a scheme delivers are also considered.

The outcomes against which potential national Grant in Aid funding for schemes is judged are focussed around protecting:

- Residential properties (rather than commercial properties or businesses)
- Protecting more deprived communities
- Environmental mitigation and enhancement

For example, if a scheme moves a large number of residents in highly deprived areas out of significant flood risk, this is likely to enhance and prioritise the case for the scheme to attract public Grant in Aid funding. It will therefore propel the scheme ‘up the ladder’ in the bid for public funding. Also, areas with properties at current and short term risk are given more priority than areas where the risk is long term.

The Strategy recommends economically sound preferred strategic approaches to managing flood and erosion risk. The total present value* cost of the Strategy is estimated to be £37.2million.
There are several different initial schemes required under the Strategy and these will need to be funded through a partnership approach, with contributions supplementing Grant in Aid monies public funding to make up the funding shortfall and ensure that the defences get built.

Having estimated the cost of undertaking each scheme within the Strategy, mechanisms to secure funding streams and contributions can be developed. Such contributions can come from:

- Directly through developers – e.g. land raising or a new frontline structure through redevelopment
- Potential beneficiaries of the schemes – private individuals or businesses
- Local levies
- Public funding - Council monies
- Contributions from developers, e.g. Section 106 monies and the Community Infrastructure Levy.
- Local Enterprise Partnership
- Monies collected by local communities or Town and Parish Councils
- Other external sources

Within the Strategy the timing of schemes has been largely based upon the timing of flood and erosion risk over the next century. As risk increases over time a number of schemes are planned in the short and medium term. In the interim, maintenance is also important to extend the life of current structures. In some cases it may be possible to fast track schemes and bring them forward in time if contributions can be secured.

Priority Schemes – now to 2025

During the development of the Strategy, the areas with the most significant flood risk and with the greatest need of additional coastal defence structures within the next 10 years were identified. These are termed the 'priority schemes' and are discussed in more detail in this section. The Isle of Wight Council will seek funding for these schemes. Areas with significant risk where schemes are required from 15 years, 'epoch 2' schemes are also highlighted in this chapter.

In Cowes and East Cowes a scheme has been developed that proposes the use of temporary flood barriers in various locations. To ensure funding efficiencies this scheme has been grouped with a similar scheme in Yarmouth which also uses temporary flood barriers. These schemes precede the long term preferred strategic options of implementing new more substantial flood defences in these areas (which are not currently affordable). Alongside the temporary flood barriers, another scheme which incorporates property level protection in several additional locations in Cowes and East Cowes has also been identified.

These priority schemes have been assessed at this strategic level to estimate the likelihood of the schemes receiving Grant in Aid monies to help pay for their delivery. The potential funding shortfalls have been estimated with contributions from other funding sources needed to meet these.

- Cowes Temporary Flood Barriers (A, B, C & D) and Yarmouth Temporary Flood Barriers: Cowes (SMZ6a) and Yarmouth (SMZ3a) are at significant risk of flooding over the next century. In Cowes and East Cowes, by 2115, 423 properties are expected to be at risk of flooding during a 1:200 year flood event whereas in Yarmouth 77 properties are expected to be at risk. To reduce the risk in Cowes and East Cowes it is proposed that temporary flood barriers are supplied in four areas (A,B,C & D) before 2025. This scheme would benefit approximately 63 residential properties. In Yarmouth it is proposed that temporary flood barriers are also supplied before 2025, benefiting approximately 12 residential properties. Both schemes assume a 20 year design life. The partnership funding score for this

*note that costs and benefits are presented in Present Value (PV) terms (unless otherwise stated). PV describes the whole life costs and benefits of an option, spread over the next 100 years and including a discount factor (providing the current worth of future sums of money). The undiscounted cash costs of the options will exceed the PV values presented.

scheme is 75% and therefore a contribution would be required for this scheme to go ahead.

- Cowes and East Cowes Property Level Protection areas (A, B & C): To reduce the risk in Cowes and East Cowes it is proposed Property Level Protection for residential properties is supplied before 2025 (scheme assumes a 20 year design life). This scheme would benefit approximately 34 residential properties. The partnership funding score for this scheme is 77% and therefore a contribution would be required for this scheme to go ahead.

Further specific details in terms of the costs, Grant in Aid eligibility and contributions required for each of the priority and other schemes are presented in the table on page 161. A map showing the location of the priority schemes is provided on page 162.

Epoch 2 schemes (aspirational from now and 2025 onwards)

In addition to the priority schemes there are other schemes which have been identified to be required early in epoch 2 (from 15 years' time). Due to funding limitations and affordability, the planned implementation of these schemes depends on whether the necessary contributions/additional funding can be acquired. These key schemes are likely to gain a proportion of Grant in Aid funding, but significant contributions will also be required. The following scheme descriptions assume that the schemes will be implemented in epoch 2, although it must be remembered that the funding case for the schemes is based on the current funding system that is likely to change in the future. The scheme identified for epoch 2 include:

- Gurnard to Cowes refurbishment: Gurnard to Cowes (SMZ5b) is at significant risk of erosion over the next century. In this area 269 properties are expected to be at risk of erosion over the next 100 years. Additionally, there are another 250 properties (approximately) at risk over the next 100 years because they are within the area of potential landslide reactivation under the developed coastal slopes. To reduce the risk it is proposed the existing seawall is refurbished when it reaches the end of its residual life (between 2025 and 2055). It is estimated this scheme would benefit approximately 89 residential properties. These scheme has a partnership funding score of 52% and contributions will be required for this scheme to go ahead.

- Bouldnor Road refurbishment: Bouldnor Road, along the Yarmouth Coast (SMZ 3a) is at significant risk of erosion over the next century. If the existing seawall fails, it is predicted that in the short to medium term the Bouldnor Road would have to be closed due to erosion resulting in collapses in the embankment, severing an important strategic transport link on the island and affecting local properties in the area. The preferred strategic option is to maintain and refurbish the wall in front of the road (810m). The refurbishment scheme has a partnership funding score of 75% and contributions will be required for this scheme to go ahead.

**For the Cowes, East Cowes and Yarmouth schemes outlined above the 1 in 75 year flood risk is presented because this is the Standard of Protection typically provided by Property Level Protection and Temporary Flood Barrier schemes.*

The future design of schemes should identify opportunities to improve accessibility when designing works, e.g. if ground surface adaptations are required to enable temporary barriers to be deployed, or during seawall strengthening.

Summary of priority schemes

Scheme	SMZ ODU	Capital cost (£)	Maintenance cost (£)	B:C	No. of residential properties benefitting	PF score	Funding shortfall (£)	Potential GiA amount (£) assuming contributions to achieve 100%
Cowes and East Cowes property level protection (ABC)	6a / W24, W25, W31	£267,200	£32,600	8.5	34	77%	£60,500	£206,700
Combined temporary barriers scheme: Cowes and East Cowes temporary barriers (ABCD) and Yarmouth temporary barriers	6a and 3a / W16, W25, W31	£773,800	£151,100	10.8	75	75%	£191,100	£582,700

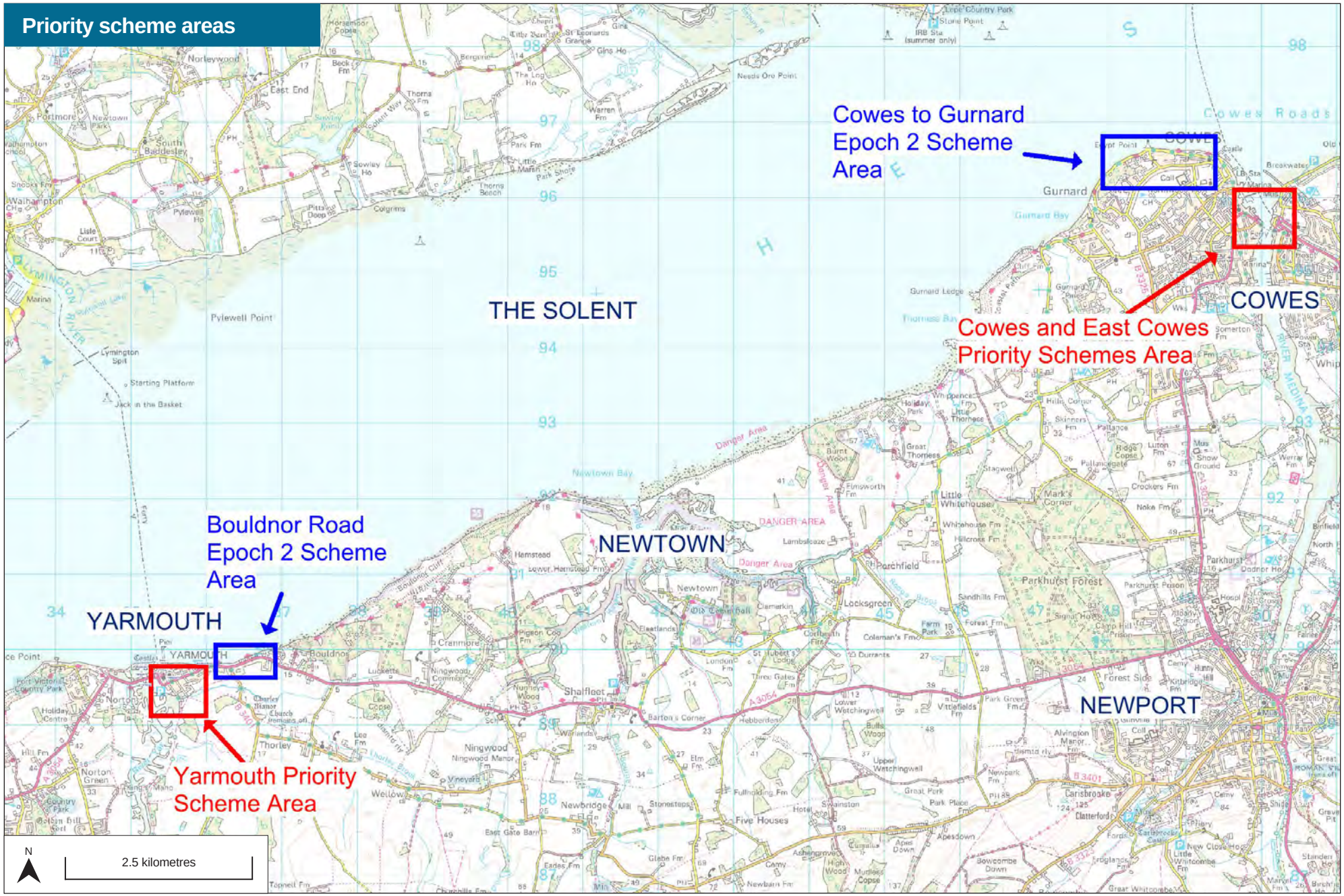
Summary of epoch 2 schemes

Gurnard to Cowes refurbishment	5b / W23	£2,800,000	£240,000	5.9	89	52%	£1,345,700	£1,454,300
Yarmouth-Bouldnor road refurbishment	3a / W17	£1,159,000	£78,000	13.5	8	75%	£291,000	£868,000

Assumptions – appraisal period is 20 years

Average indicative numbers over the whole life of the scheme

Priority scheme areas



Tennyson Down cliffs

View towards Cowes from across the Medina

next?

What next?

Find out more....

next?

Finalising the Strategy, and the way forward

The Strategy underwent a three-month period of public consultation in Spring 2016 (as outlined in Chapter 3) and is put forward for adoption by the Isle of Wight Council and approval by the Environment Agency. Following approval, the Strategy actions will be implemented with commencement of the priority schemes over the coming few years. Each of the priority schemes will be developed in full detail, in consultation with the communities affected. The Isle of Wight Council and Environment Agency will continue efforts to secure funds for the priority schemes.

Find out more

We would like to take this opportunity to thank the communities and organisations involved in the development of the Strategy. The Strategy will guide coastal practitioners on the best approach to future management of this coastline.

If you have difficulty understanding this document, please contact us on 01983 821000 and we will do our best to help you.

ISLE of WIGHT COUNCIL

Contact us:
Isle of Wight Council, Planning & Housing Services, Seaclose Offices, Fairlee Road, Newport, Isle of Wight, PO30 2QS.

Email. coast@iow.gov.uk Tel. (0)1983 821000
Web. www.coastalwight.gov.uk & www.iwight.com

Arabic
إذا كان لديك صعوبة في فهم هذه الوثيقة، الرجاء الاتصال بنا على هاتف رقم01983 821000 وسوف نبذل قصارى جهدنا لمساعدتك.

Hindi
यदि आपको इस दस्तावेज़ को समझने में कठिनाई पेश आ रही है तो, कृपया हमारे साथ **01983 821000** पर सम्पर्क करें और हम आपकी सहायता करने का पूरा प्रयास करेंगे।

Punjabi
ਜੇਕਰ ਤੁਹਾਨੂੰ ਇਹ ਦਸਤਾਵੇਜ਼ ਸਮਝਣ ਵਿਚ ਮੁਸ਼ਕਲ ਪੇਸ਼ ਆ ਰਹੀ ਹੈ ਤਾਂ ਕ੍ਰਿਪਾ ਕਰਕੇ ਸਾਡੇ ਨਾਲ 01983 821000 'ਤੇ ਸੰਪਰਕ ਕਰੋ ਅਤੇ ਅਸੀਂ ਤੁਹਾਡੀ ਸਹਾਇਤਾ ਕਰਨ ਦੀ ਪੂਰੀ ਕੋਸ਼ਿਸ਼ ਕਰਾਂਗੇ।

Urdu
اگر آپ کو اس دستاویز کو سمجھنے میں مشکلات کا سامنا ہو تو براہِ مہربانی ہم سے اس نمبر پر رابطہ کیجئے 01983 821000 اور ہم آپ کی مدد کرنے کے لیئے ہرممکن کوشش کریں گے۔

Chinese
如果您对此份文件难以理解，请致电01983821000与我们联系。我们将力尽所能帮助您。

Bengali
এই তথ্য বুঝতে না পারলে অনুগ্রহ করে আমাদেরকে 01983 821000 নাম্বারে ফোন করবেন। আমরা আপনাকে যথাসাধ্য সাহায্য করবো।

Polish
Jeśli mają Państwo trudności w zrozumieniu niniejszego dokumentu, prosimy o kontakt z nami pod numerem 01983 821000 – dołożymy wszelkich starań, by Państwu pomóc.

French
Si vous avez des difficultés à comprendre ce document, veuillez nous appeler au 01983 821000 et nous ferons de notre mieux pour vous aider.

Italian
Per ulteriori chiarimenti su questo documento, Vi preghiamo di contattarci per telefono al numero 01983 821000 dove riceverete la nostra migliore attenzione.

German
Sollte es Ihnen Schwierigkeiten bereiten, dieses Dokument zu verstehen, rufen Sie uns bitte an unter 01983 821000, und wir werden unser Bestes tun, um Ihnen zu helfen.

Hungarian
Ha nehézséget okoz e dokumentum értelmezése, kérjük, forduljon hozzánk a 01983 821000 számon, és minden tőlünk telhetőt megteszünk, hogy segítsünk.

Spanish
Si tiene dificultad para entender este documento, por favor póngase en contacto con nosotros llamando al número 01983 821000 y haremos todo lo posible para ayudarle.

Romanian
Dacă aveți dificultăți în înțelegerea acestui document, vă rugăm să ne contactați la numărul 01983 821000 și vom face tot ceea ce putem să vă ajutăm.






Environment Agency

Funded by UK Government

CAPITA | AECOM

ISLE of WIGHT COUNCIL