

**RIVER ITCHEN, WESTON SHORE,
NETLEY & HAMBLE
COASTAL STUDY**



NOVEMBER 2011



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1 Introduction

The River Itchen, Weston Shore, Netley & Hamble Coastal Study has been prepared by Mouchel on behalf of a commissioning partnership between Southampton City Council, Eastleigh Borough Council and Fareham Borough Council.

Initially this project was designed to deliver a formal Coastal Defence Strategy(CDS) for the but due to the minimal need in the study area for schemes for either coastal erosion or flood defence it has not been considered appropriate to take this study forward to a formal Coastal Defence or Coastal Flood and Erosion Risk Management Strategy. Notwithstanding this, the study has provided technical input to the recently adopted North Solent Shoreline Management Plan (2010) and will provide technical support for any future coastal projects and schemes. This study will therefore support the hierarchy of plans that apply to this coastline. The study will also provide the starting point should it prove necessary in the future to review the need for a formal strategy.

It should be noted that, in the absence of a formal strategy, any schemes or projects proposed in the area will require additional information at an appropriate level for the scheme where this is not provided by this study,

A wide range of strategies and plans exist for the management of the coast for flood defence and erosion. These include large-scale plans such as Shoreline Management Plans (SMP) and more detailed investigations and schemes. This study sits between these layers of plans to support the development of schemes or future strategic studies. Figure 1 below shows the hierarchy of plans that apply to this area of the coastline.

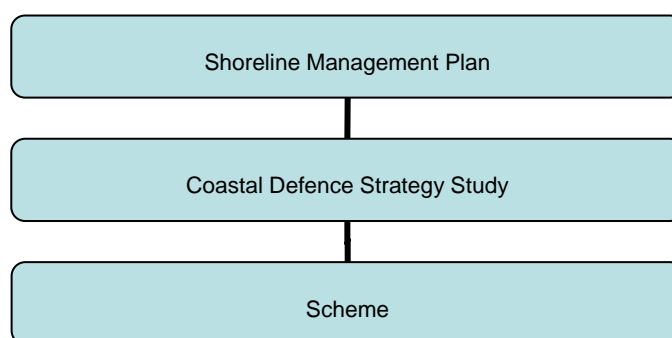


Figure 1: Hierarchy of Coastal Plans

This study area is located within the boundaries of the North Solent Shoreline Management Plan (published for public consultation in February 2010) which supercedes the Western Solent and Southampton Water SMP (1998) and the East Solent and Harbours SMP (1997).

In general, the study recommendations are consistent with the recommendations of the SMP, unless the detailed investigations suggest otherwise. In this case, policy options that have been developed in this study have informed those presented in the North Solent SMP.

The study is not limited to capital works (i.e. construction of defences) but can include any programme of management or action, for example implementation of a flood warning strategy or improved flood forecasting.

This report has been developed in accordance with Defra guidance notes FCERM-AG. Its development has also taken into consideration the requirements of the Environment Act for a Strategic Environmental Assessment (SEA) of the plan and the Habitats Regulations throughout.

It should be noted that much of the supporting work for this study was carried out between 2005 and 2006. As such it is based on the Defra sea flooding levels and climate change predictions available at that time. The draft was near to completion in early 2007, but its publication was significantly delayed by the emergence of new requirements under the Habitats Regulations in 2007. The legislation required that all plans and projects that might have an impact on environmentally sensitive sites, designated under the European Habitats Directive, must be the subject of an Appropriate Assessment (AA) under the Habitats Regulations. As the study area contains a significant number of designated sites, the subsequent assessment and revisions as a result of its findings led to a significant delay in the completion of the project.

A Key Stakeholder Group has overseen the development of the study. It comprised officers from each of the funding local authorities together with representatives of statutory consultees as shown in **Table 1**.

Table 1: Members of the Key Stakeholder Group

Organisation	Contact
Southampton City Council	Rob Crighton / Bernadine Maguire (Lindsay McCulloch)
Eastleigh Borough Council	Alun Brown
Fareham Borough Council	David Watkins / Scott Mills (Tina Cuss)
Hampshire County Council	Steve Blyth / Alan Inder
Environment Agency	Tim Kermode
Natural England	Claire Lambert

2 Structure of this report

This report is the main study document for consultation. It contains the following sections:

Section 1:	Introduction
Section 2:	Structure of this Report
Section 3:	Defining the CDS
Section 4:	Supporting Investigations
Section 5:	Consultation
Section 6:	Understanding the Study Area
Section 7:	Environmental Assessment
Section 8:	Selection of Policy Options
Section 9:	Policy Options Assessment
Section 10:	Economic Appraisal of Policy Options
Section 11:	Recommended Policy Options
Section 12:	Action Plan (0-20 years)

A number of supporting studies have been carried out to support the study. These are included in full in the appendices, as follows:

Appendix A:	Description of Policy Units
Appendix B:	List of Information Reviewed
Appendix C:	Coastal Processes Baseline Study
Appendix D:	Regime Modelling
Appendix E:	Asset Survey
Appendix F:	Geomorphological Survey
Appendix G:	Consultation Letter
Appendix H:	List of Consultees
Appendix I:	Consultee Responses
Appendix J:	Strategic Environmental Assessment (SEA) Report
Appendix K:	Habitats Regulations Appraisal (HRA) Report
Appendix L:	Not used
Appendix M:	Economic Analysis

3 Defining a CDS

3.1 Why do we need a CDS?

Whilst this study does not constitute a CDS it will provide support for any future strategy and for any individual coastal and flood defence schemes within the study area.

We have to plan and justify our coastal flood and erosion risk management works as we are using public money to fund any schemes. To help us make the right choices, we undertake strategies which are long term to make sure we fully understand any future implications of what we do to our coast now. This also ensures we look at the potential wider effects of any works carried out on the coast.

3.2 Purpose of a CDS

The primary objective of the CDS is the protection of people and their assets and property from coastal erosion and flooding, through the development and implementation of a sustainable strategy for coastal defence which is compatible with natural processes, environmentally acceptable, economically and technically viable and which is compatible with preferred management strategies in neighbouring areas and with the higher level SMP2 covering the study area.

Strategy objectives

- To provide an appropriate level of coastal and flood defence to prevent coastal erosion and flooding of properties and the low-lying hinterland.
- To provide sustainable defences, which utilise natural defence mechanisms wherever possible.
- To enhance the natural environment and to increase the potential for recreation and tourism.
- To provide a blueprint for future monitoring and programming of maintenance works.
- To increase the understanding of the shoreline and to focus consultations in a strategic manner.
- To aid co-ordination and to consolidate information gathered within higher level plans.

3.3 The Study Area

The study area lies along the north eastern shores of Southampton Water which connects via the Solent to the English Channel. The study area comprises the River Itchen, Weston, Netley and River Hamble frontages. This forms part of the area dealt with by the North Solent SMP. The study looks at a smaller area, in greater detail than the SMP. The North Solent SMP has taken into account the findings of this work.

The study area includes the east bank of the River Itchen as far upstream as Woodmill Lane Bridge, the Weston, Netley and Hamble-le-Rice section, and both banks of the River Hamble as far upstream as the Bursledon Railway Bridge. It consists of 16 Policy Units, two along the eastern side of the River Itchen, six along Southampton Water and eight along the River Hamble. Figure 2 illustrates the study boundaries and the extent of each Policy Unit.

3.4 Description of Policy Units

The study boundaries at the western limit of the ITCH3 process unit and the eastern limit at HAM8 (see Figure 2) are consistent with the limits set in the existing SMP which is characterised by economic investment linked to maintaining the hard coastal defences.

A full description of each of the Policy Units is provided in **Appendix A**, including photographs from the asset survey and geomorphological survey site visits. **Table 2** below shows the Policy Unit name and a description of each unit's start and end points.

Table 2: Policy Unit names and descriptions

SMP Policy Unit Name	Study Policy Unit Name	Policy Unit Description
5c11	ITCH3	Woodmill Lane to Cobden Bridge
	ITCH4	Cobden Bridge to Weston Point
5c10	NET1	Weston Point to Netley Castle
5c09	NET2	Netley Castle to Netley Hard
	NET3	Netley Hard to Cliff House
5c08	NET4	Cliff House to Ensign Industrial Park
5c07	NET5	Ensign Industrial Park to Hamble Oil Terminal
5c06	NET6	Hamble Oil Terminal to Hamble Common Point
5c05	HAM1	Hamble Common Point to Satchell Marshes
5c04	HAM2	Satchell Marshes to Badnam Creek
5c03	HAM3	Badnam Creek to Lands End Lane
	HAM4	Lands End Lane to Swanwick Shore Road
5c02	HAM5	Swanwick Shore Road to Universal Marina
	HAM6	Universal Marina
	HAM7	Universal Marina to Warsash North
5c01	HAM8	Warsash North to Hook Park

An overview map of the entire study area is shown in Figure 2. The boundaries of each of the Policy Units listed in **Table 2** above are illustrated on this overview map. Figures 3 to 18 show each of the individual Policy Units.

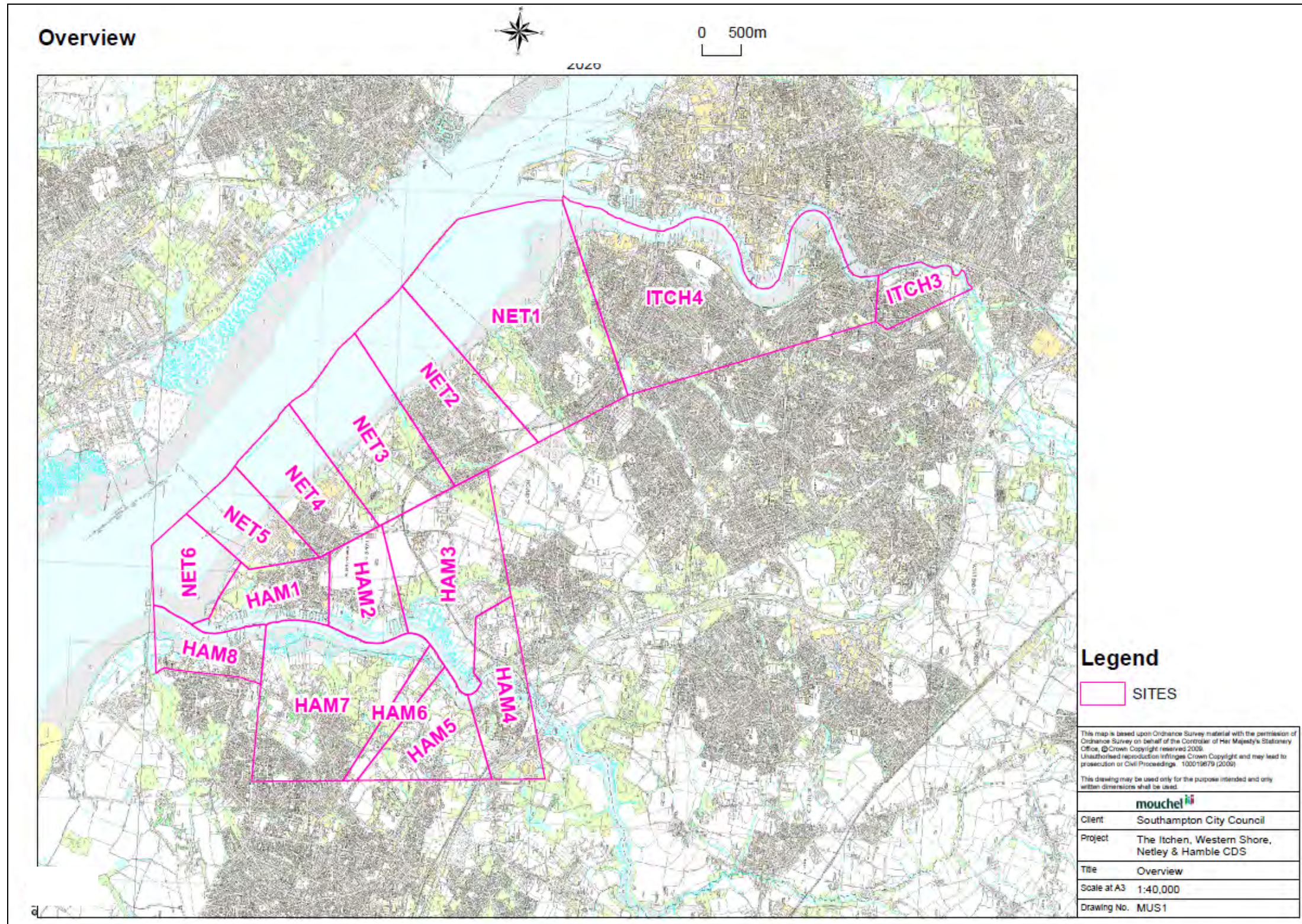


Figure 2: Overview map of the CDS study area showing the Policy Units



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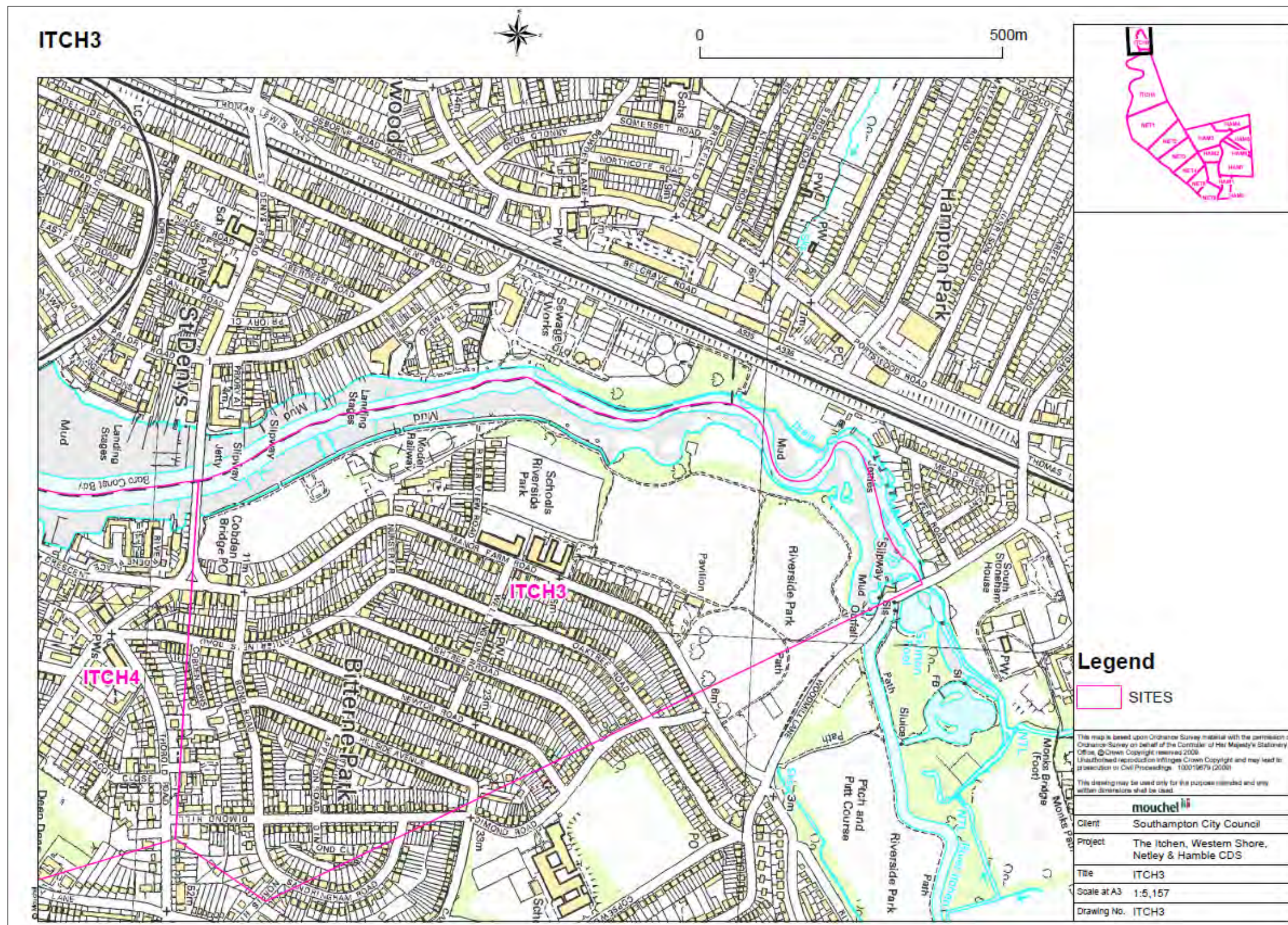


Figure 3: Policy Unit ITCH3



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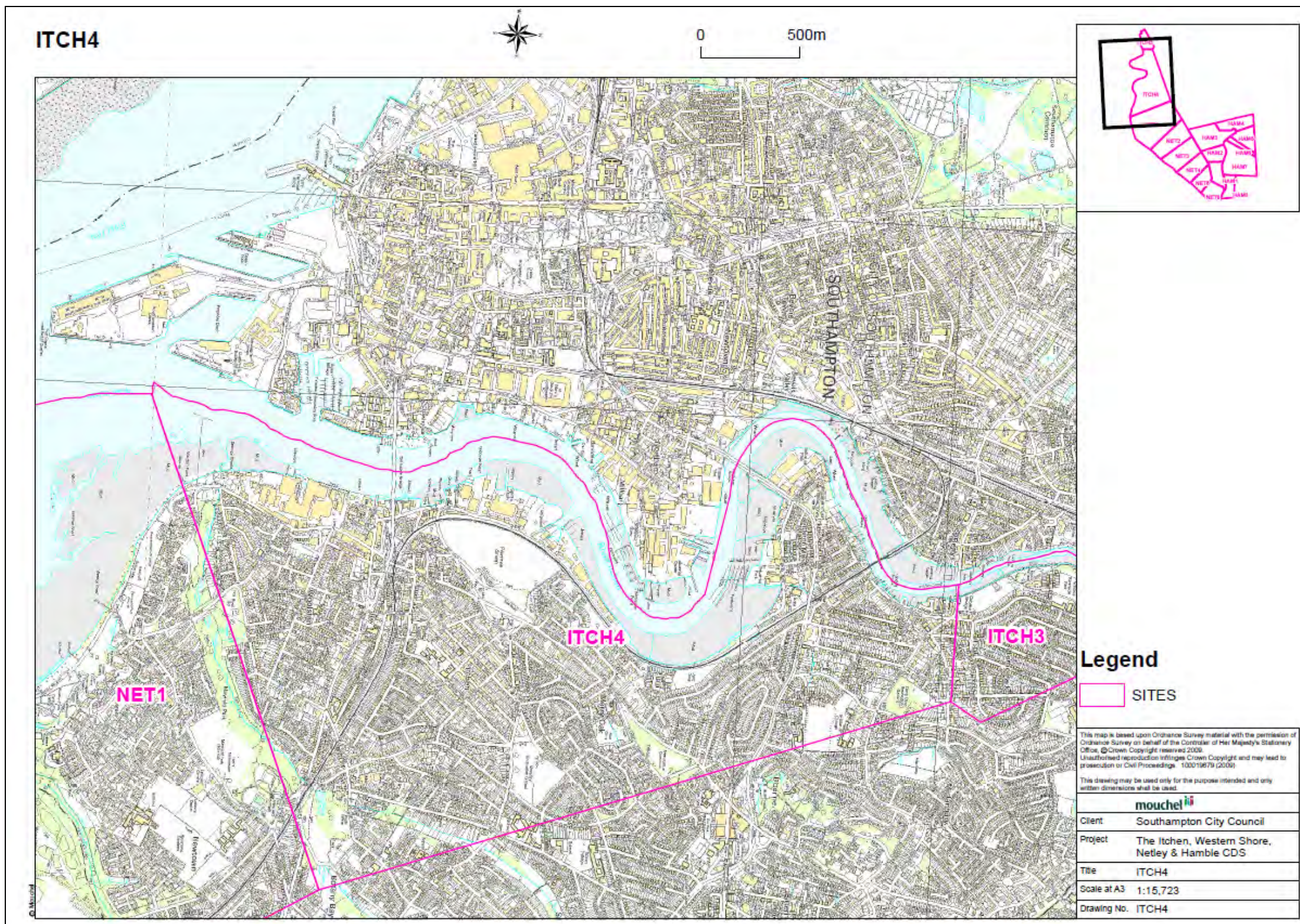


Figure 4: Policy Unit ITCH4



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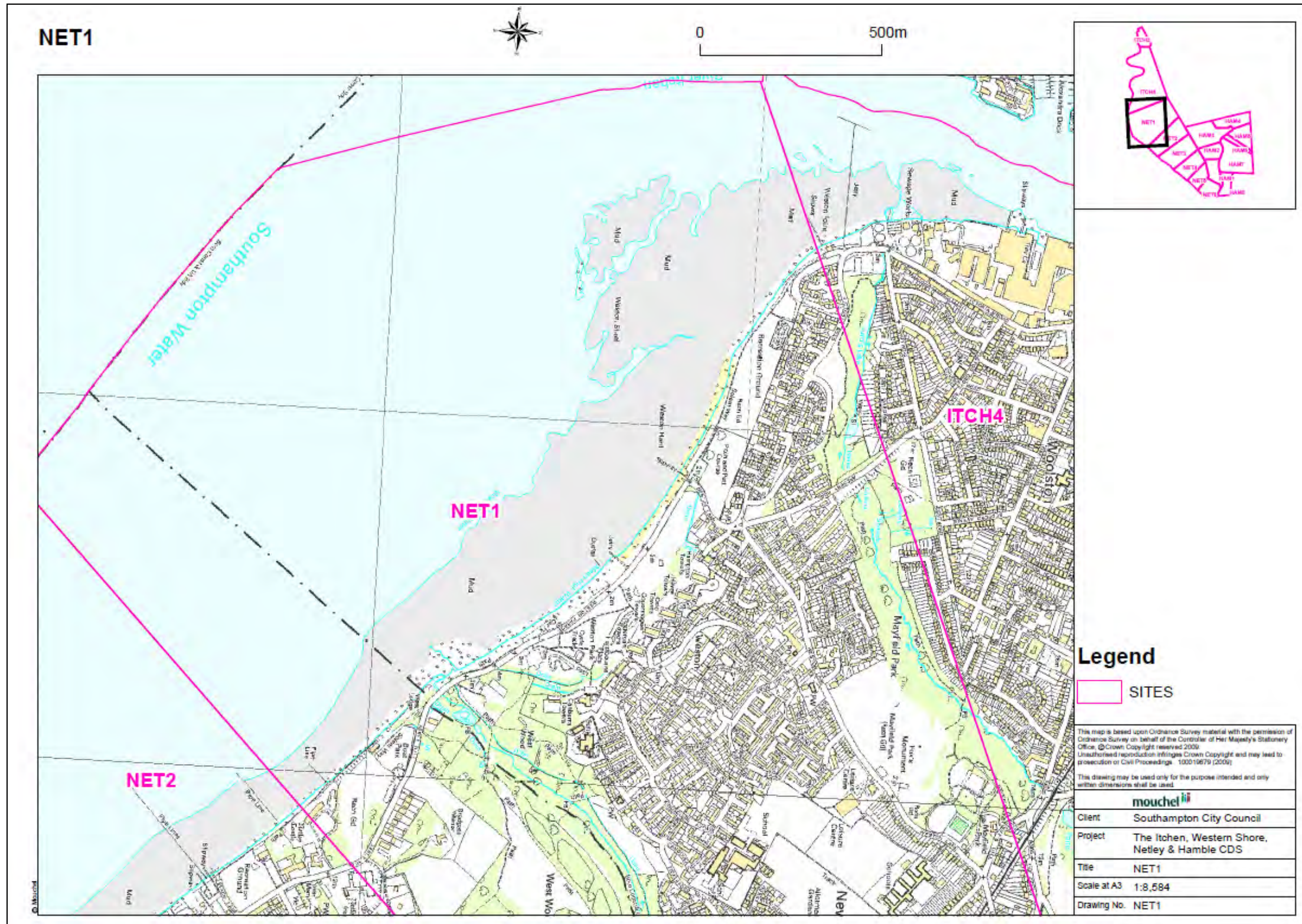


Figure 5: Policy Unit NET1



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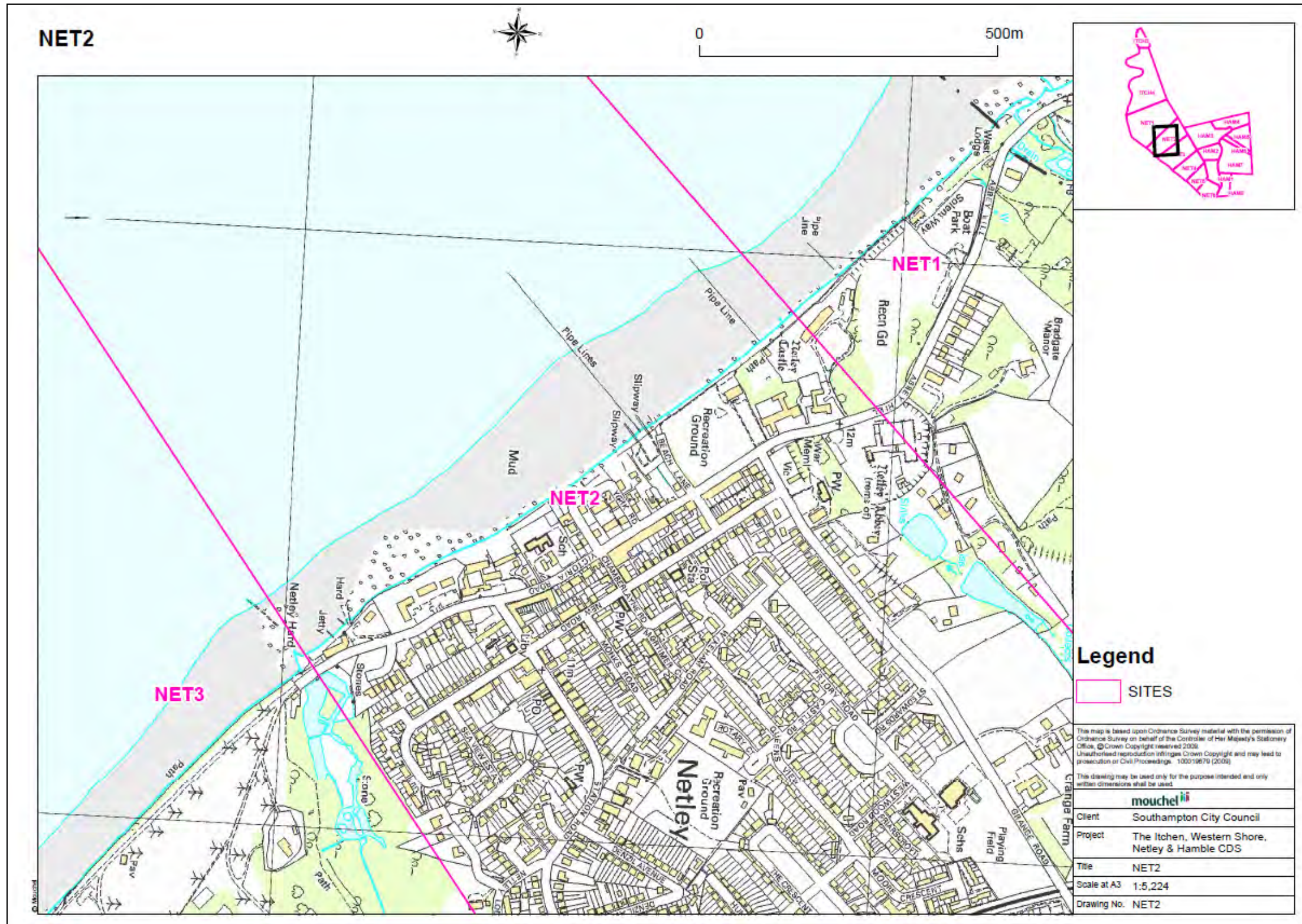


Figure 6: Policy Unit NET2



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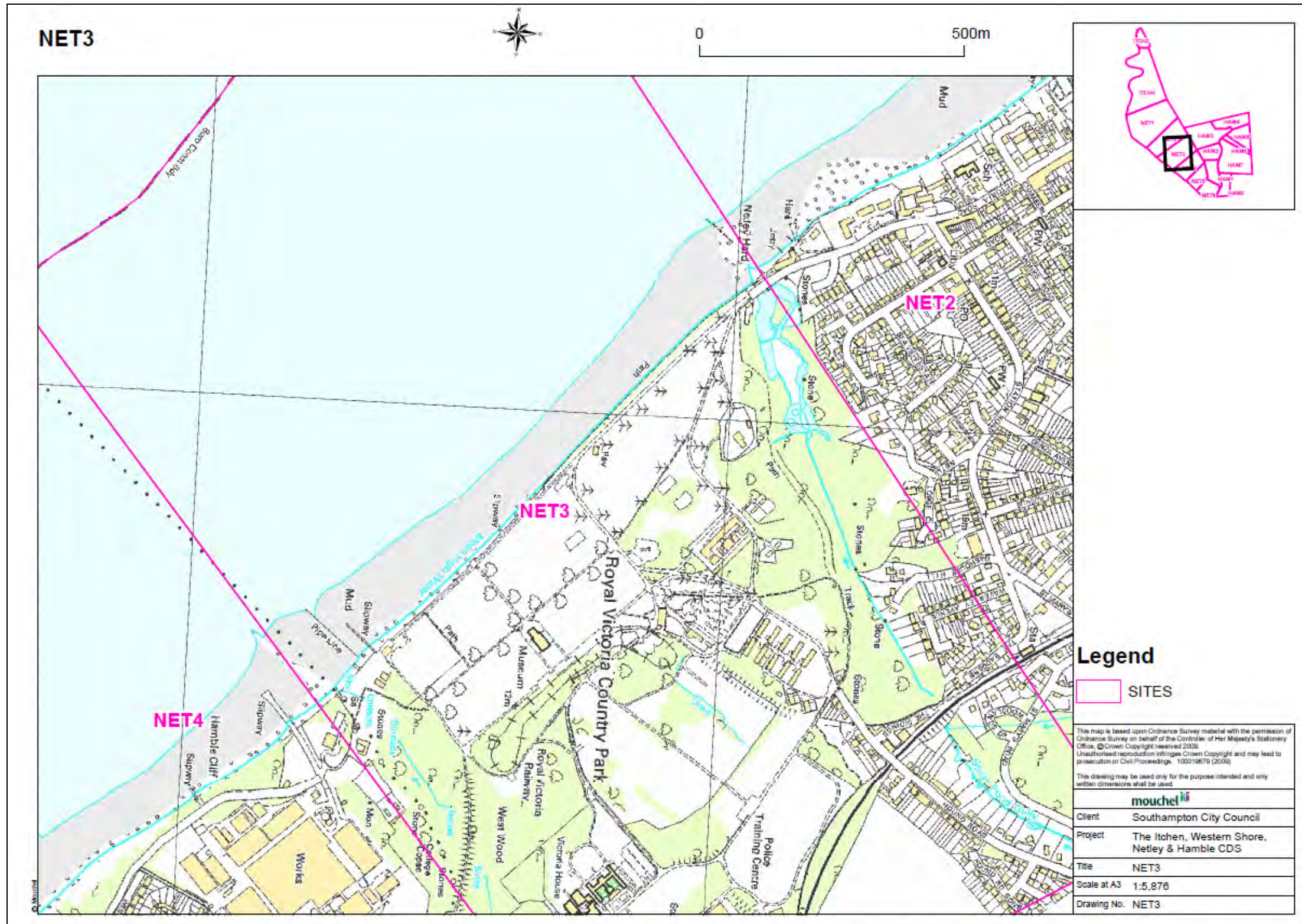


Figure 7: Policy Unit NET3



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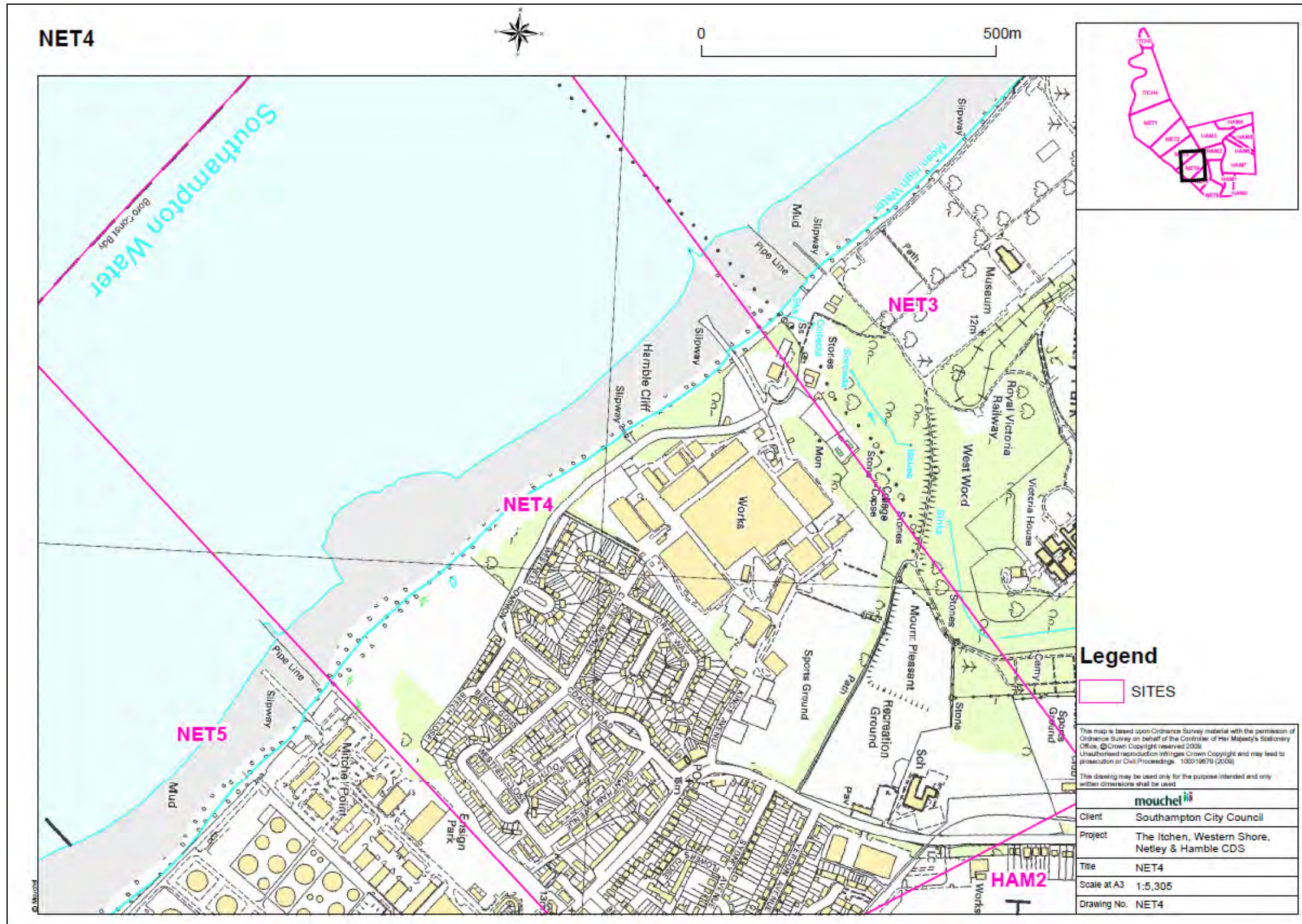


Figure 8: Policy Unit NET4



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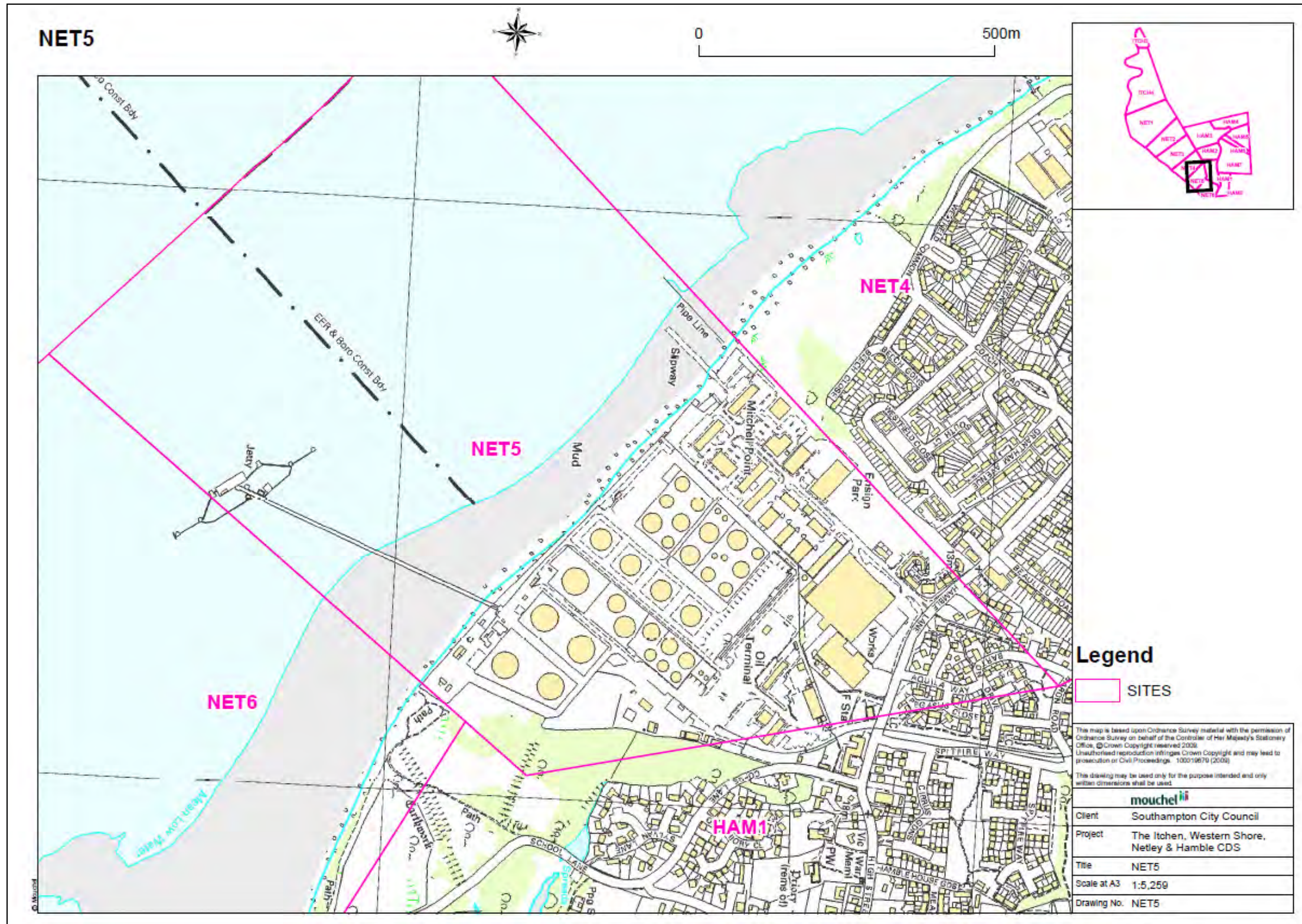


Figure 9: Policy Unit NET5



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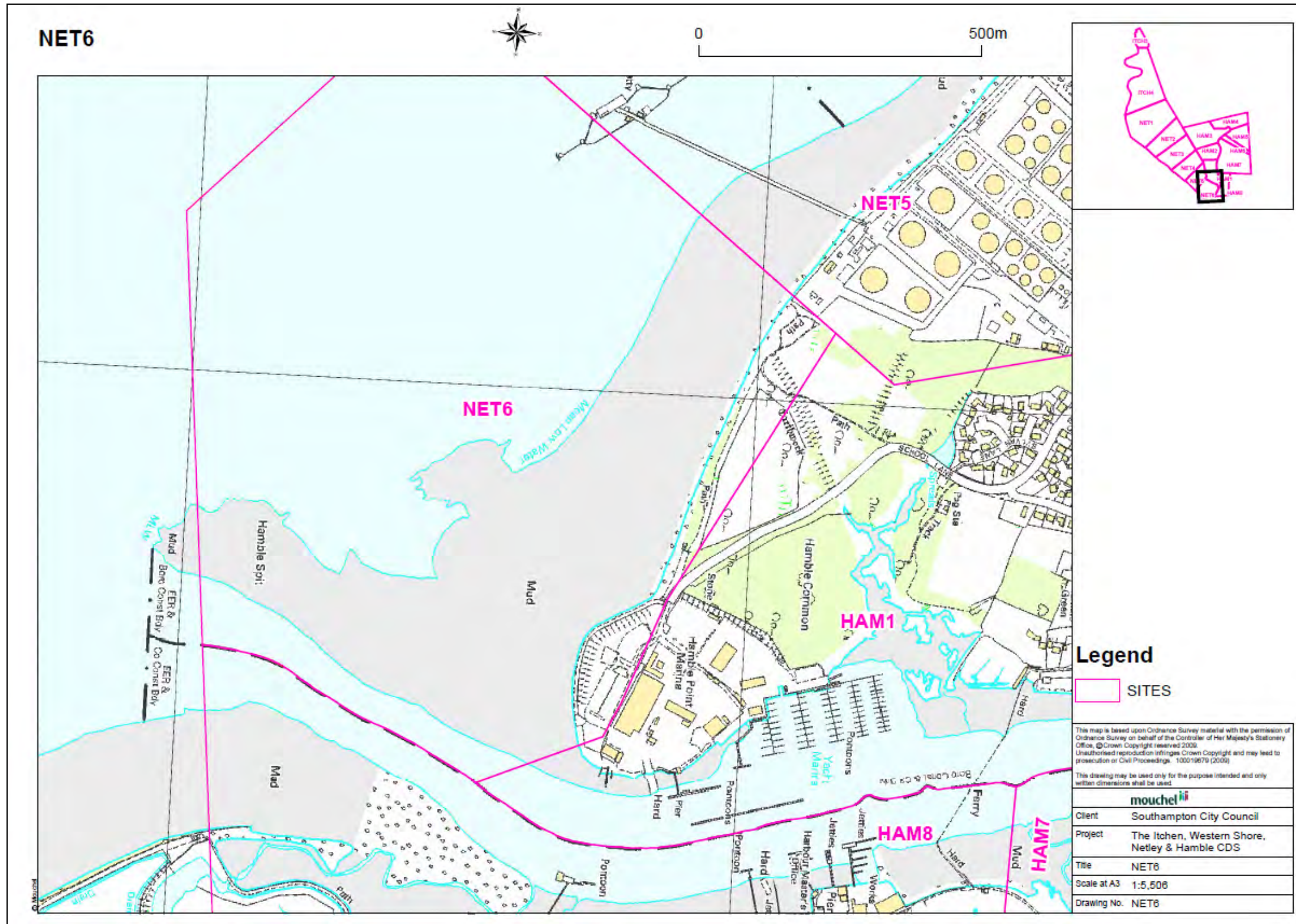


Figure 10: Policy Unit NET6



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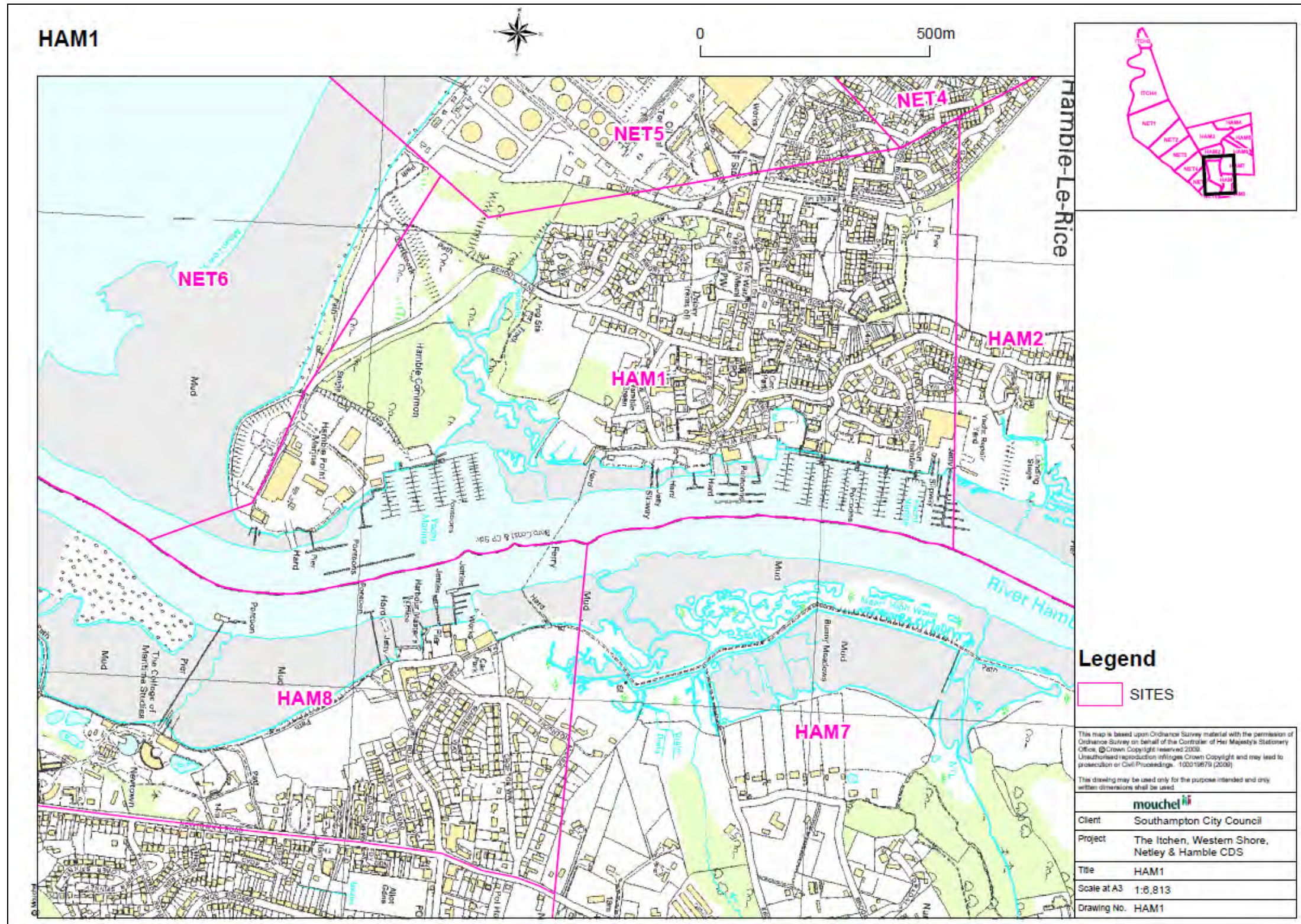


Figure 11: Policy Unit HAM1



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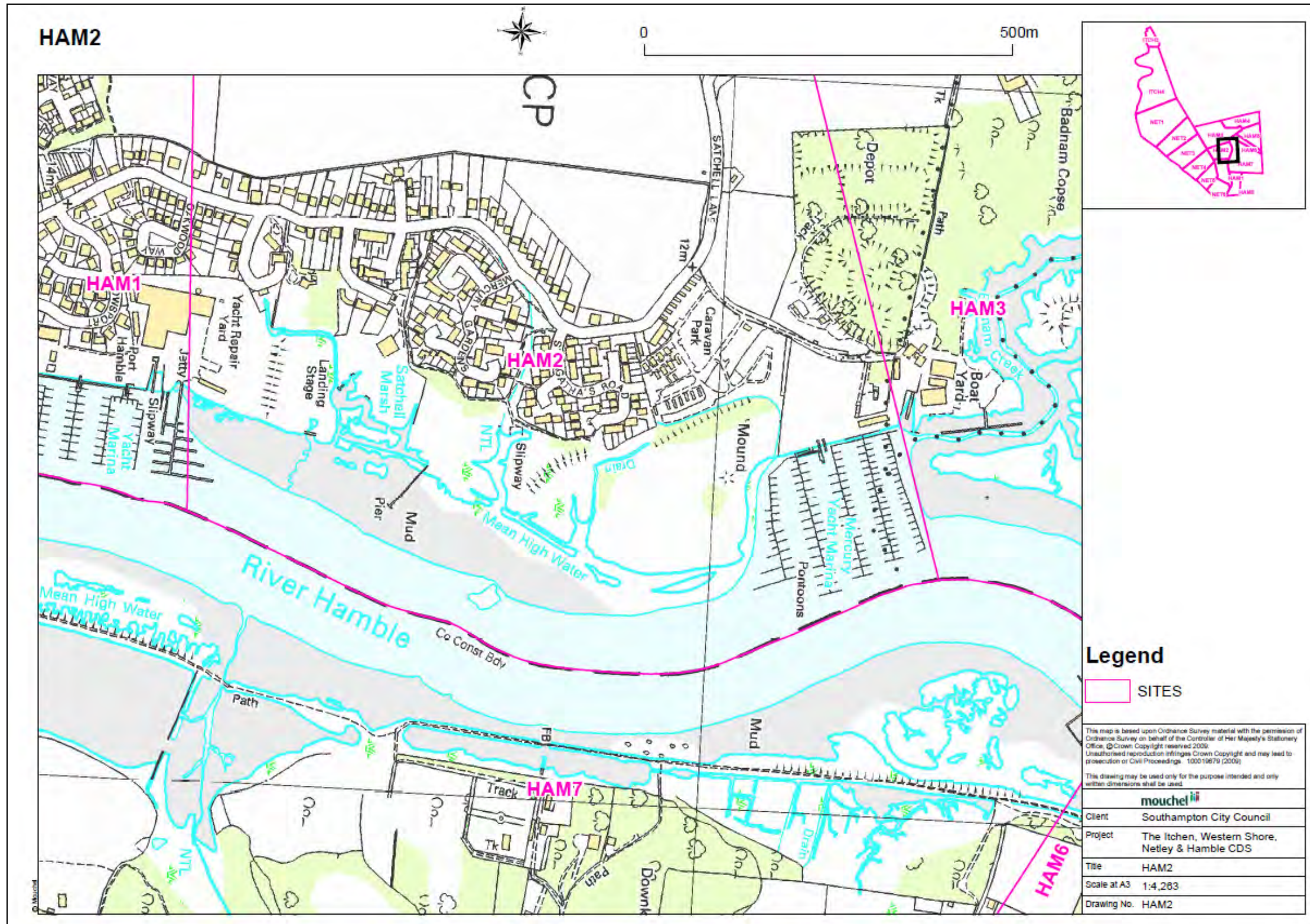


Figure 12: Policy Unit HAM2



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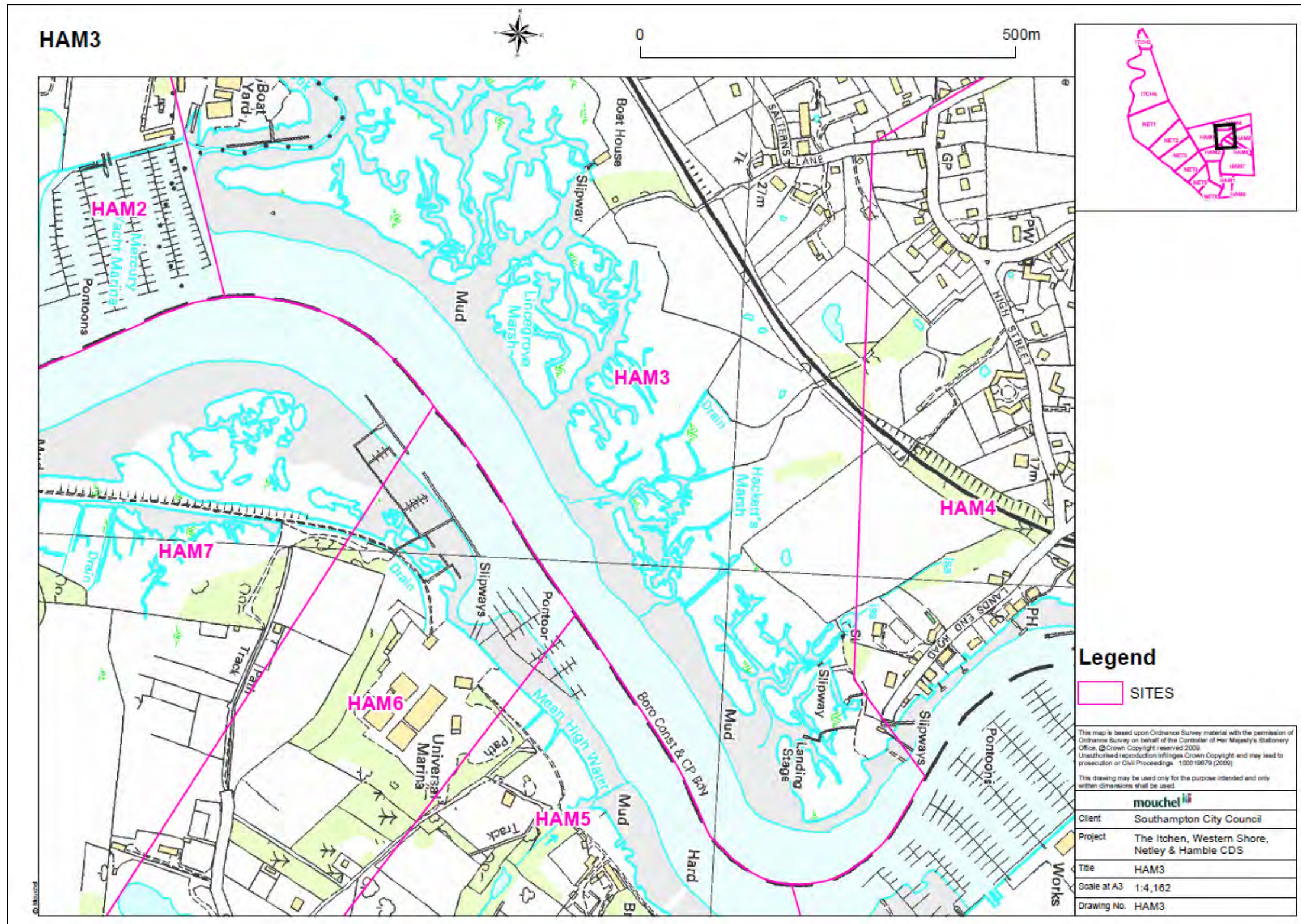


Figure 13: Policy Unit HAM3



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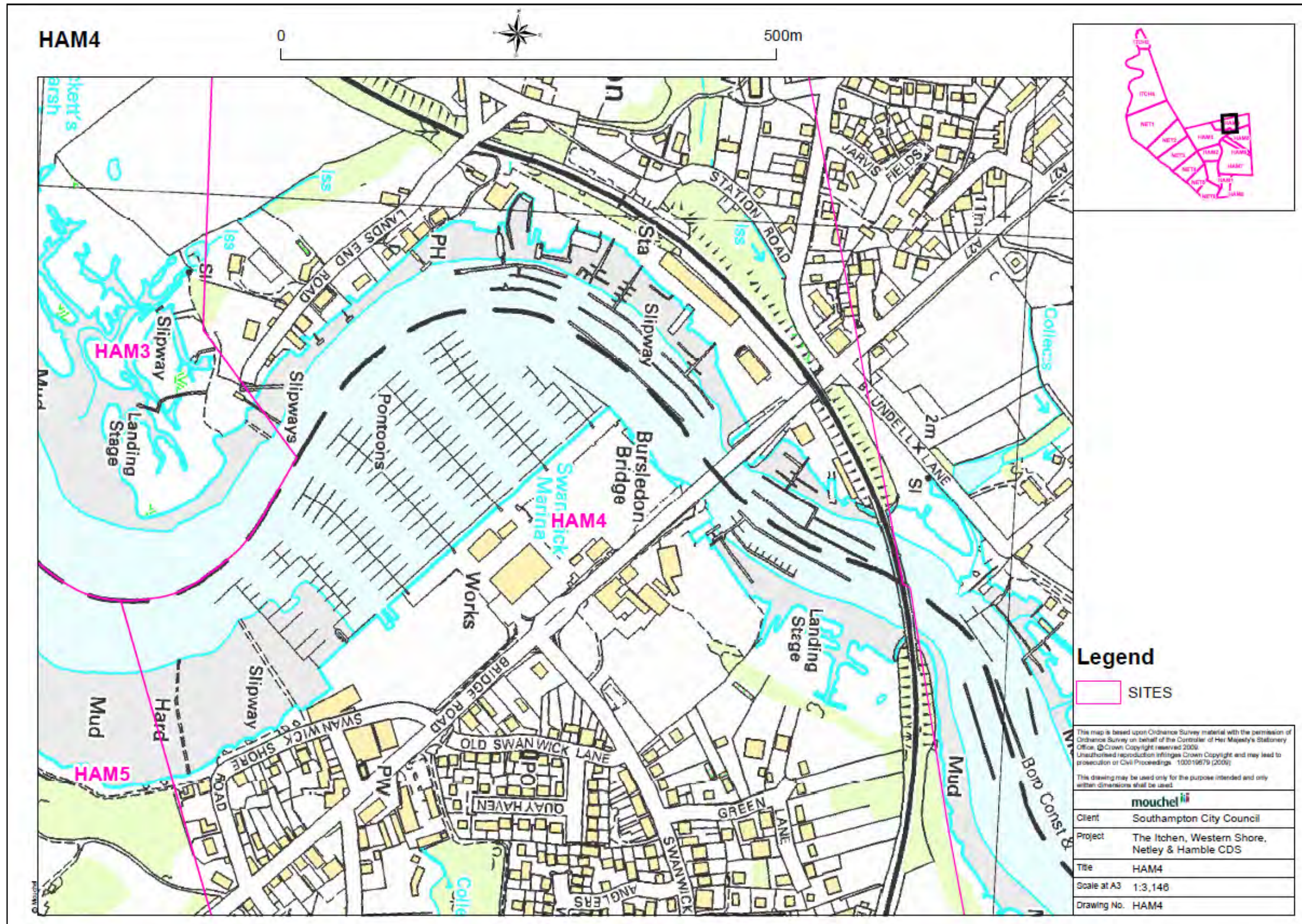


Figure 14: Policy Unit HAM4



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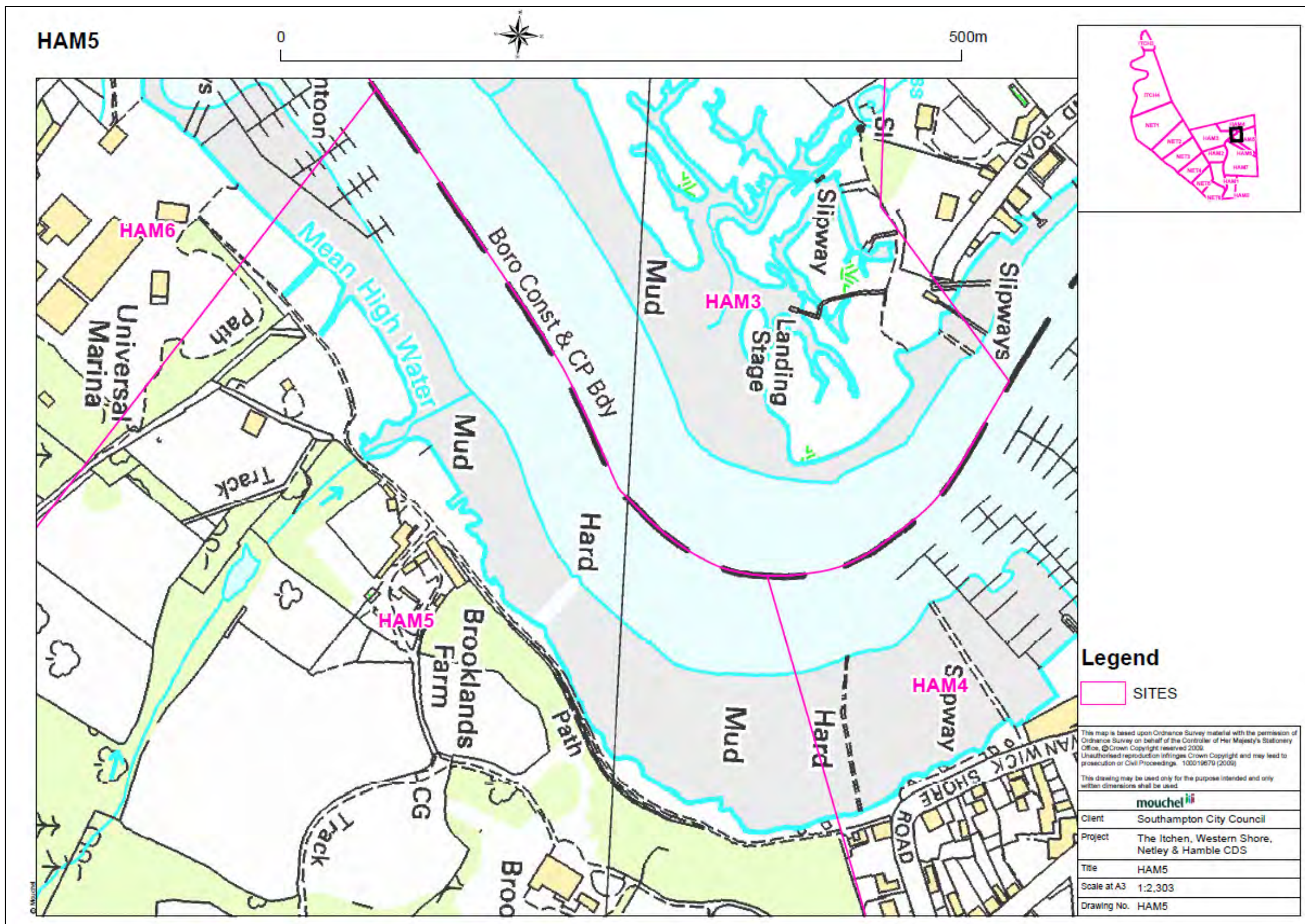


Figure 15: Policy Unit HAM5



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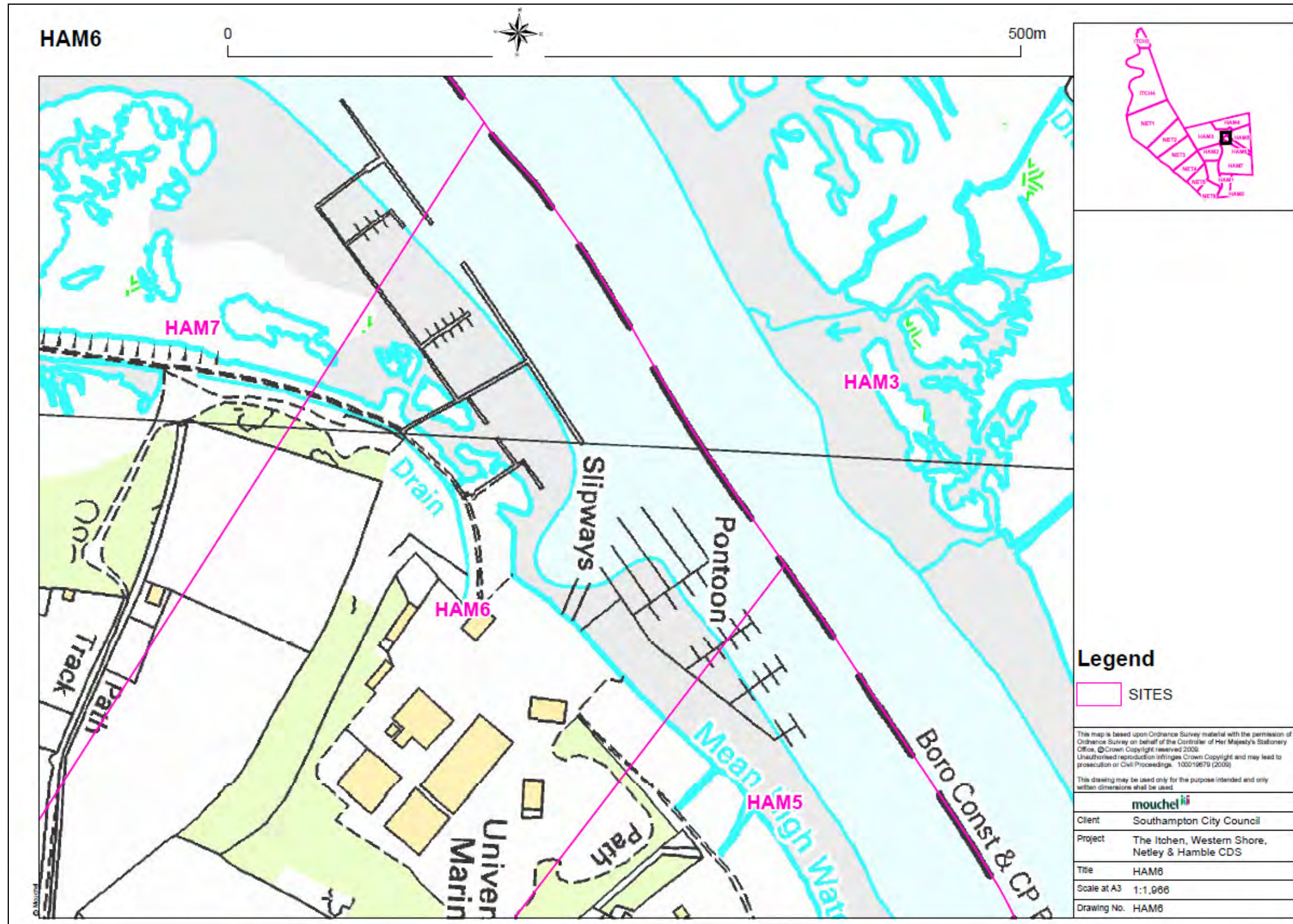


Figure 16: Policy Unit HAM6



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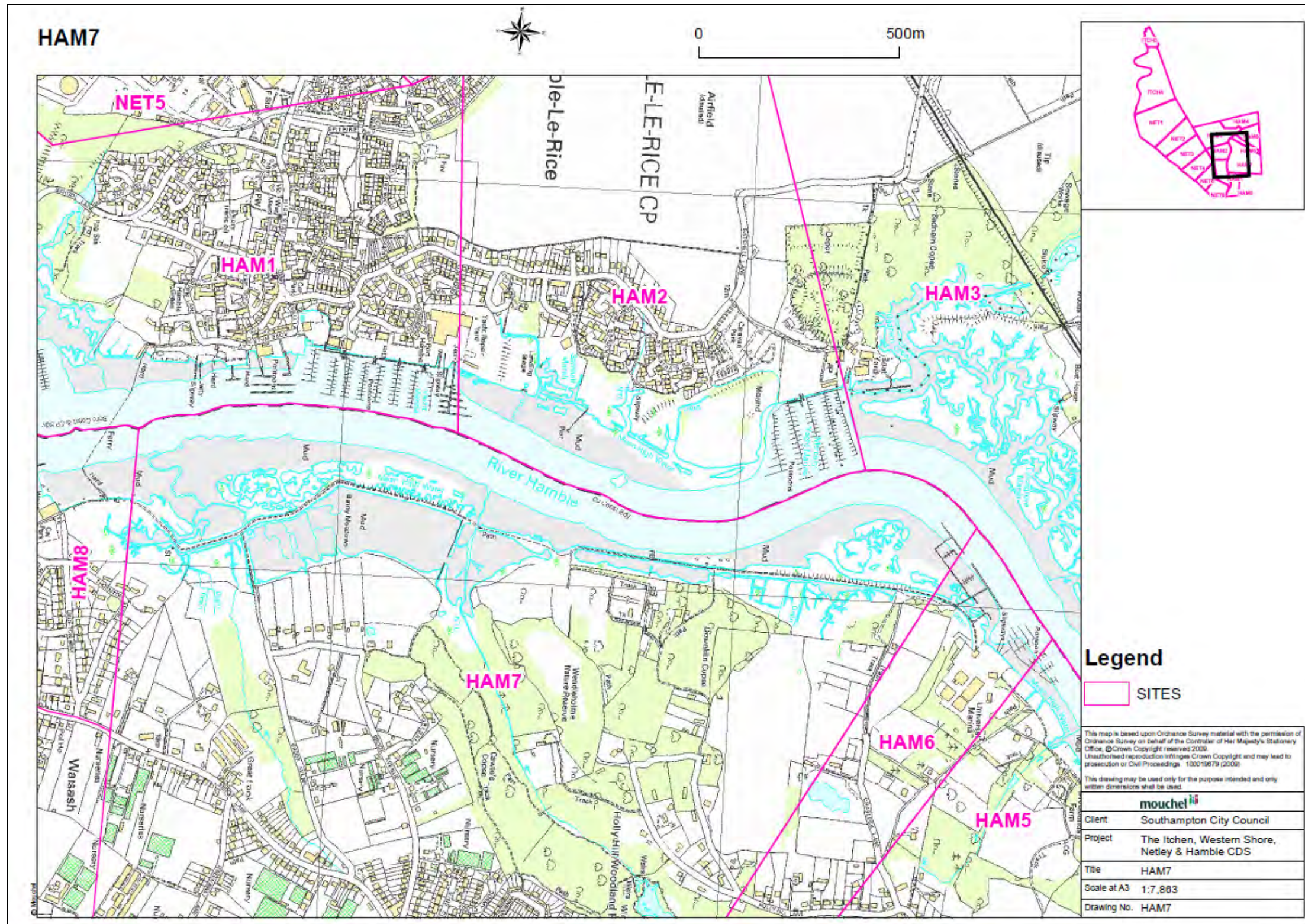


Figure 17: Policy Unit HAM7



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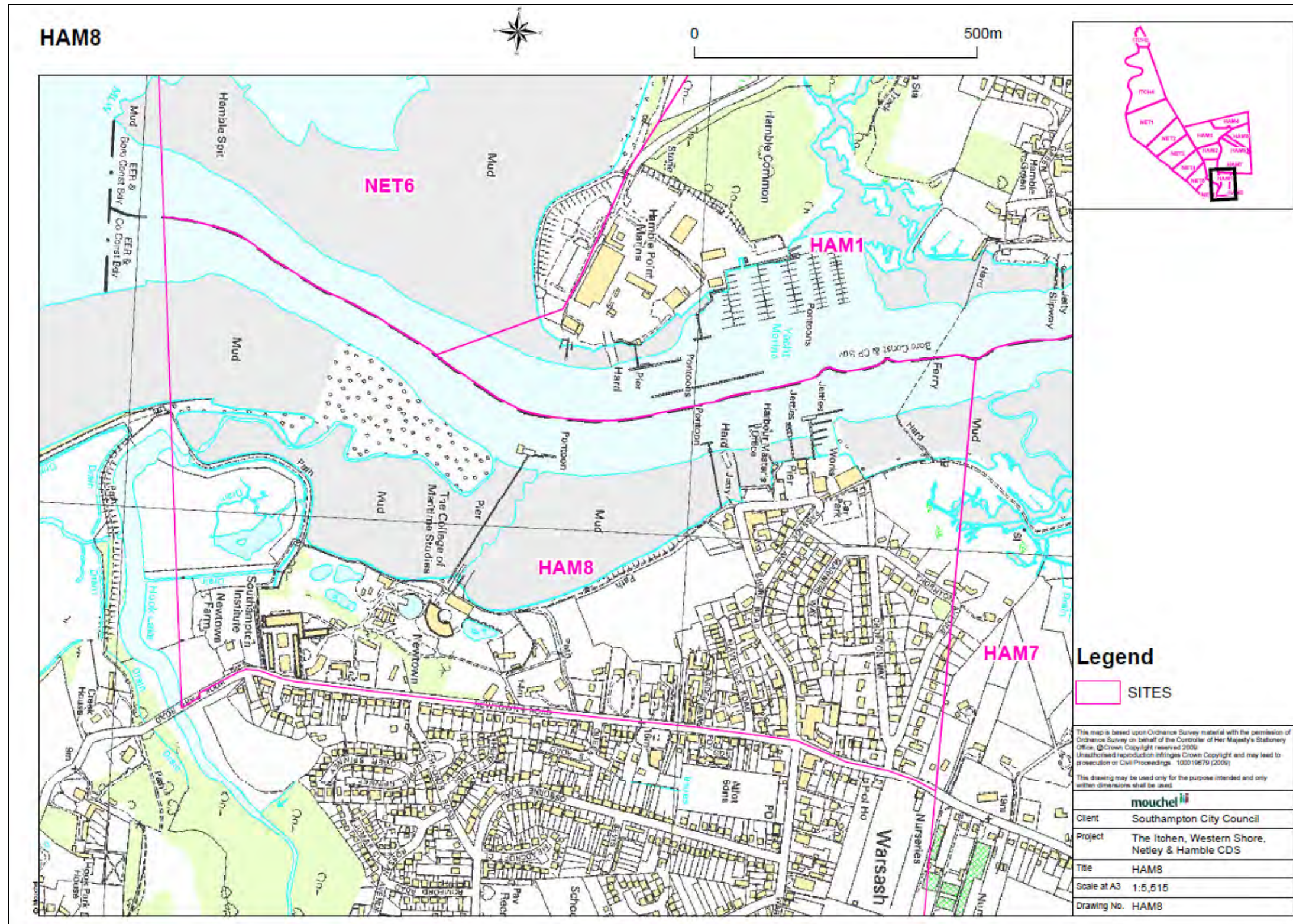


Figure 18: Policy Unit HAM8



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3.5 Significant Opportunities & Constraints

The study area is largely urbanised, particularly along the River Itchen, and is highly developed, containing oil industry, ship yards marinas and moorings. The remaining undeveloped areas and nearshore zone are heavily used for recreation and at the same time contain, together with the intertidal zone, considerable environmental assets including substantial areas designated under the European Habitats Directive.

- Much of the coastal area is developed and contains important infrastructure including the Hamble Oil Terminal;
- Much of the coastal property is privately owned and has been defended by piecemeal actions at landowners expense;
- Undeveloped areas and the intertidal zone contain considerable environmental assets, including substantial areas designated under the European Habitats Directive;
- Much of the open shoreline is subject to active erosion and accretion processes;
- The shoreline and nearshore zone is heavily used for recreation.

Long term climatic changes could increase the risk of breaching, damage to shoreline structures and the risk of overtopping and flooding and could increase the rate of erosion on presently undefended parts of the study area.



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4 Supporting Investigations

Several detailed studies, including two coastal processes studies, have been carried out in support of the development of this study. Full reports are provided in the appendices and a brief summary of the results of these studies are given here.

The key studies undertaken were:

- 4.1 Review of existing information**
- 4.2 Baseline Coastal Processes Study**
- 4.3 Estuary Regime Modelling**
- 4.4 Studies of Existing Coastal Protection**
 - 4.4.1 Geomorphological survey
 - 4.4.2 Assessment of Assets
- 4.5 Environmental Assessments (Section 8)**
 - 4.5.1 Strategic Environmental Assessment
 - 4.5.2 Appropriate Assessment under the Habitats Regulations (Appendix K)

4.1 Review of Existing Information

To gain a good understanding of the study area, a review was undertaken of existing published information and data about the study area. This included reports produced by each of the local authorities with responsibilities in the study area (Southampton City Council, Eastleigh Borough Council, Fareham Borough Council and Hampshire County Council) such as Local Planning documents, as well as reports commissioned by the Environment Agency, Defra and other agencies.

A number of academic papers and studies were used, as well as surveys and reports from other organisations with a coastal interest. A full list of the information reviewed is provided in **Appendix B**.

This information has been used to develop our understanding of the study area, and is summarised in **Section 6** of this report.

4.2 Baseline Coastal Processes Study

To inform the study and the selection of recommended policy options for each Policy Unit, a baseline study of the current coastal processes was carried out. The study provides the scientific understanding of the local estuary processes in the context of the estuary as a whole.

The study area is characterised by a spring tide range of 4.0m between -2.24mOD and 1.76mOD. The flood tide shows a unique pattern (see Figure 19) described as a “Young flood stand” at which a water level of ~ -0.5 mOD is maintained for up to two hours. High water occurs as a fairly flat double peak with high water being maintained for up to three hours. This unique pattern leads to the ebb tide lasting for only ~ 5 hours but it can be as short as 2.5 hours.

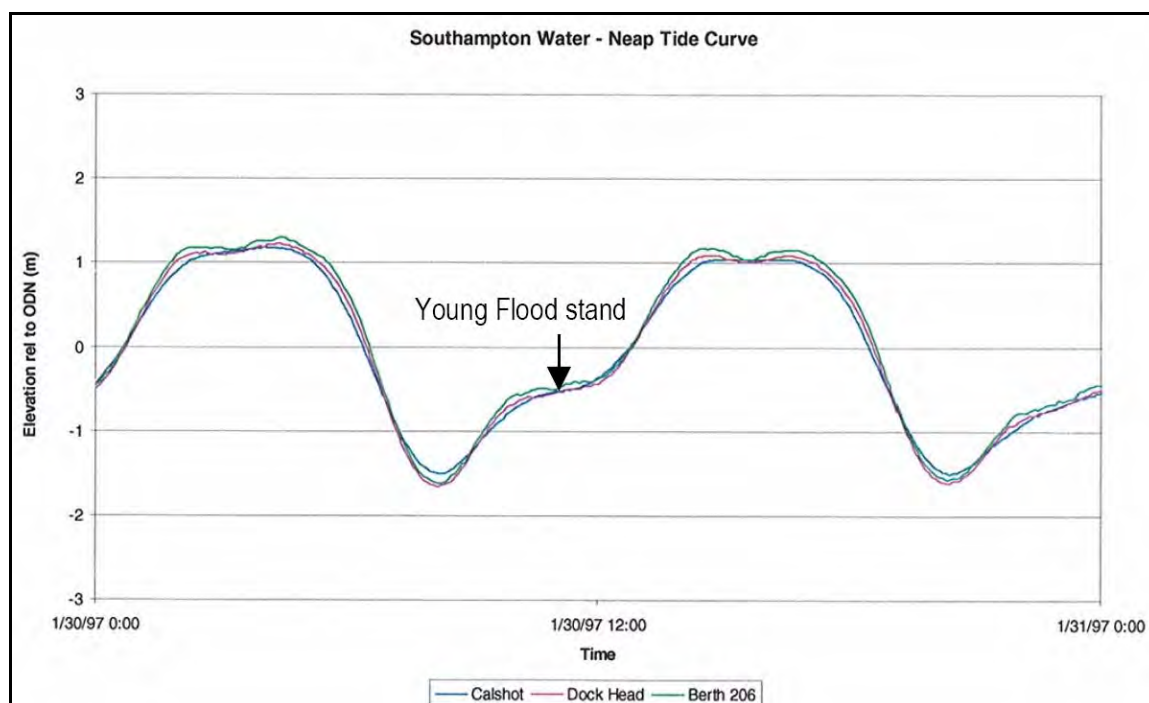


Figure 19: Neap tide curve for three locations within Southampton Water showing the Young flood stand, high tide double peak / plateau and the flood – ebb tide asymmetry.

Extreme water levels have been calculated in the baseline study, indicating extreme water levels of 2.83mOD at Calshot for return periods of 1 in 100 years.

Based on historical tide data for Portsmouth, the mean tide level has increased by 1.7mm per year. However, high water levels are influenced by the change in the tidal amplitude associated with the 18.6 year lunar nodal tidal cycle leading to a rise in the high water level by ~ 0.2 m over the period 2006 to 2015/2016.

With the predominant wind direction from south-westerly directions, that is at approximately a right angle to Southampton Water, wave height is extremely fetch limited and extreme wave heights for winds from $225 - 255^\circ$ are 1.48m, while they can theoretically reach up to 1.74m for winds from $165 - 195^\circ$. While ship waves are important within Southampton Water and its tributaries, their contribution to the Weston to Hamble-le-Rice frontage is small in comparison to that of wind waves.

Annual dredging removes close to 400,000m³. The sources of this material are suspended sediment input from the wider Solent area (approximately ~75%), erosion of intertidal areas (approximately 12%), erosion of subtidal areas (7%) and input from the rivers, saltmarsh and cliff erosion (6%). This natural net gain is a consequence of the tidal pattern with its prolonged flood tide.

In general, the intertidal areas in Southampton Water erode slowly downwards while extending landwards, resulting in relatively stable areas of mudflat. The landward migration of mudflats forces the landwards migration of saltmarshes, which, in the presence of defences, leads to a reduction in saltmarsh area from coastal squeeze and a general decrease in intertidal area with rising sea levels. In some areas like the Weston to Hamble-le-Rice frontage however, tidal flow reversal during the Young flood stand, together with a landward direction of the tidal flow during the last leg of the flood tide, mean that these areas can accumulate in the intertidal which in the Regime Modelling Study (Figure 20) leads to a seaward movement of the high water line under the 'Do nothing' defence scenario.

Direct historic measurements of the saltmarsh changes have only been carried out for the western side of Southampton Water which show a continuous decline, however, based on changes in the position of the low water line, this seems to also have occurred along the Hamble-le-Rice to Itchen frontage. This frontage has, at least over the period 1996 to 2005, suffered erosion of the intertidal shingle beach in most places. The full coastal processes baseline study can be found in **Appendix C**.

4.3 Estuary Regime Modelling

To support the study outputs, a numerical modelling study of Southampton Water, the River Itchen and the River Hamble was developed using the 'Regime Theory' approach. This approach is based on the well founded assumption that some form of relationship exists between the morphological characteristics of a cross channel section (e.g. width and depth) and its hydraulic parameters (e.g. discharge, flow velocity, hydraulic slope). It is further assumed that this relationship will form equilibrium over time.

In this study, carried out by ABPmer, this approach has been coupled with a hydrodynamic model that provides the input flow conditions of a tidal estuary. Changing the flow conditions, e.g. through a change of mean water level in the hydrodynamic model will require a change in the morphology to reach an equilibrium, while changes in the morphology (e.g. narrowing or widening of the channel through the presence/removal of defences) will alter the hydraulic parameters and may change the depth of the channel.

The purpose of the study was to assess the influence of rising sea level at the mouth of Southampton Water on water levels, hydrodynamics and most importantly morphology within Southampton Water and the rivers Hamble and Itchen. This assessment was carried out for the policy options of 'Hold the line' and 'Do nothing' at 2026, 2056 and 2106 assuming a constant sea level rise of 6mm/yr[†].

The results of the modelling show that the pattern of increasing water levels up into the rivers is maintained for all time slices and under both policy options, and that the water levels in the rivers increase in line with sea level rise at the mouth of Southampton Water. There is a slight tendency for water levels to be lower in the upper parts of the Itchen and Hamble for the 'Do Nothing' scenario compared to 'Hold the line', being most pronounced on the River Itchen in 2106, however, even there

[†] Note the 6mm sea level rise per year is sourced from PPG25. PPG25 has since been superseded by PPS25 which quotes a higher level of sea level rise for the South Coastal of England.

the maximum water level is predicted to be only <0.1m lower under the 'Do Nothing' scenario. The modelling results would suggest that there is very little difference in water level regardless of the defence option.

The regime modelling has also assessed the changes in intertidal area under the 'Hold the Line' scenario, the intertidal area is shown to decrease over the next 100 years in Southampton Water by 860,000m² (11%); in the River Hamble by 530,000m² (9%); and the River Itchen by 110,000m² (6%). In all three areas there is little change over the period 2006 to 2026 with the main change occurring between 2026 and 2056 in the Rivers Hamble and Itchen and between 2056 and 2106 in Southampton Water. Increases in water levels whilst maintaining the current lines of defence leads to coastal squeeze, the loss of intertidal area, and makes the existing defence structures and cliffs more susceptible to erosion.

Under the 'Do Nothing' scenario the intertidal area is shown to increase in Southampton Water by 1,280,000 m² (17%) and in the River Itchen by 490,000m² (28%), while in the River Hamble it is shown to slightly decrease by 150,000m² (3%). While the increase in Southampton Water is gradual over time, in the River Itchen it occurs between 2056 and 2106. Under the 'Do Nothing' scenario and rising water levels, the estuary as a whole is not only able to roll back and maintain the present extent of intertidal area, but also to expand and increase the intertidal area (except River Hamble). In Southampton Water and the River Itchen this is due to the availability of land close to the present inundation level, while the River Hamble is lacking this space being a narrower valley. A copy of the Estuary Regime Modelling can be found in **Appendix D**.

Figure 20 shows the extent of intertidal areas for the three study sites under 'Hold the line' (Hold) and 'Do Nothing' (Nothing) scenarios at present and in 20, 50 and 100 years. The increase in water level is shown for reference.

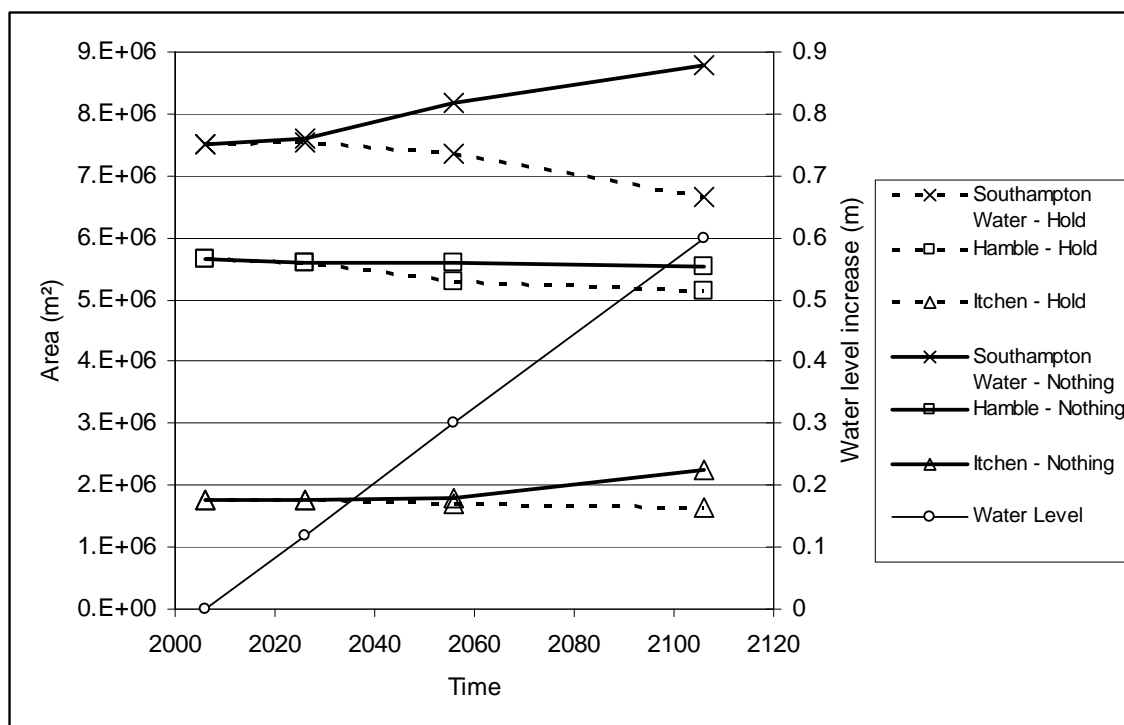


Figure 20: Extent of intertidal areas for three locations within the study area under 'Hold the line' (Hold) and 'Do Nothing' (Nothing) scenarios at present and in 20, 50 and 100 years.

4.4 Assessment of Assets

In the autumn of 2006 a walk over survey of the coastal defences along the entire study frontage was carried out. Photographs and written records were made of each flood defence asset. The Asset Survey Report is presented in **Appendix E**.

The asset survey together with existing information, for example from the Environment Agency's National Flood and Coastal Defence Database (NFCDD), has been used to fully describe each of the Policy Units within the study area. This section describes the assessment method used and provides details of each of the Policy Units recorded as part of this survey.

This assessment was carried out in accordance with the Environment Agency Condition Assessment Manual, Ref. 166_03_SD01 (October 2006) using the banding for assessing fluvial and coastal assets set out in **Table 3**.

Table 3: Visual Condition Descriptors, (Environment Agency, Condition Assessment Manual, October 2006)

Condition	Description	Residual Life (years)
1	Very Good. Cosmetic defects that will have no effect on performance.	>20
2	Good. Minor defects that will not reduce the overall performance of the asset.	11 - 20
3	Fair. Defects that could reduce performance of the asset.	6 - 10
4	Poor. Defects that would significantly reduce the performance of the asset. Further investigation needed.	1 - 5
5	Very Poor. Severe defects resulting in complete performance failure.	<1

The Standard of Protection of each defence was assessed by comparison with modelled water levels (as described in the Coastal Processes Baseline Study, see **Section 4.2**) with existing defence crest heights (with and without allowance for freeboard) in order to determine probability of exceeding.

Since January 2007 a new system using 'Criticality Weighting' has been included in the assessment process in order to assess the overall condition of assets. The asset assessment has been updated to reflect this change.

Table 4 shows the Criticality Weighting scores. The 'Overall Asset Condition' has been determined by multiplying the 'Visual Condition Grade' by the 'Criticality Weighting' score (See **Table 5**).

Table 4: Criticality Weighting Descriptors, January 2007

Criticality	Weighting Number	Description
Very Minor	1	Elements that relate to non-flood risk reduction. However such elements may be important for other aspects of asset performance (e.g. PRSA, H&S)
	2	An element that is not part of the engineered structure, but does have a function connected with flood risk reduction.
Important (low)	3	An element that is integral to the asset but has limited function in reducing flood risk.
	4	An element that is part of the asset that works together with other major elements to reduce flood risk.
Important Medium	5	Part of the asset, which by its failure will not cause the asset to fail. However, may lead to failure over long period of time.
	6	An element which when it fails will cause the structure to fail over a long period of time (up to a year).
Important (high)	7	An element which when it fails will cause the structure to fail but not immediately but prior to the next inspection date. Signs of failure may be evident.
	8	An element which when it fails will cause the asset to fail but not immediately but within 3 months. Signs of failure may be evident.
Critical	9	An element which when it fails will cause the asset as a whole to fail immediately.

Table 5: Overall asset condition

Process Unit	Start	End	Unit length (m)	Defended length (m)	Defence Type	Visual Condition Grade	Criticality	Overall Asset Condition
ITCH3	Woodmill Lane Bridge	Cobden Bridge	1585	780	Masonry revetment with steel / timber piling at toe	2	2	2
ITCH4	Cobden Bridge	Weston Point	7991	4970	Various. Steel sheet pile walls and the remaining defences as sea walls. Assorted jetties and quays. dock wall	3	5	4
NET1	Weston Point	Netley Castle	2078	550	undefended – soft cliff – shingle beach and bank – masonry sea wall	4	5	5
NET2	Netley Castle	Netley Hard	1094	695	Masonry sea wall – breached in one location – soft cliffs – ad hoc gabion defences – steel sheet pile wall	4	5	5
NET3	Netley Hard	Cliff House	1123	990	Concrete wall – steel sheet pile wall – low cliffs	4	6	5
NET4	Cliff House	Ensign Industrial Park	998	50	Low cliffs	N/A	N/A	N/A
NET5	Ensign Industrial Park	Hamble Oil Terminal	792	590	Foreshore embankment – steel sheet pile wall	2	5	4
NET6	Hamble Oil Terminal	Hamble Common Point	876	420	Mixed shingle and sand beach - limestone rock revetment	1	3	2
HAM1	Hamble Common Point	Satchell Marshes	2026	1220	Rock embankment - seawall - steel sheet pile walls adjacent to the pontoons	1	4	3
HAM2	Satchell Marshes	Badnam Creek	1333	600	Saltmarsh – steel sheet pile walls at marina	3	4	4
HAM3	Badnam Creek	Lands End Lane	1574	0	Saltmarsh	N/A	N/A	N/A
HAM4	Lands End Lane	Swanwick Shore Road	2189	1190	Slipways, timber palisade and steel sheet pile wall masonry wall, gabions, masonry wall, masonry and brick wall; rock revetment; sheet pile walls with a concrete capping beam.	3	4	4
HAM5	Swanwick Shore Road	Crableck Marina	719	140	Cobble filled gabions - brick wall	3	1	2
HAM6	Crableck Marina	Crableck Marina	296	296	Concrete capped steel sheet pile wall timber breastwork wall earth embankment	2	1	2
HAM7	Crableck Marina	Warsash North	2354	1570	Earth embankment with a shingle foreshore or revetment	3	1	2
HAM8	Warsash North	Hook Park	1731	1150	Masonry sea wall on top of an embankment - concrete seawall on steel sheet piles - sea wall with steel sheet pile toe	3	7	5



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4.5 Geomorphological Survey

The study area comprises of defended and undefended lengths of shoreline. In order to establish a clear baseline understanding of the undefended sections of coast, a geomorphological survey comprising an assessment of ground conditions, cliff stability, cliff protection and cliff recession rates by desk study and mapping along the northern margin of Southampton Water was undertaken between the mouths of the River Itchen and the River Hamble (**Appendix F**).

Along the shoreline between the Itchen and Hamble Rivers there are shingle beaches backed by cliffs that range from a low scarp of less than 1m up to 9m height as well as heath land, marsh and wooded slopes. The study found that the areas of undefended cliffs are generally eroding and the shoreline is retreating with the notable exception of much of the Net 4 Policy Unit that is characterised by comparatively wide beaches and stable, vegetated slopes. Observations on the rate of retreat confirm findings in previous reports.



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5 Consultation

Consultation with interested parties is an essential part of the development of any strategy. This is important to establish the primary concerns of those with responsibilities in the study area, and those who may have a personal interest in the area. It is essential that any decisions made in the development of policy options can stand up to scrutiny, as such the principles of openness and access have been applied throughout the development of the options. Within the study area, there are a number of interests and consultation was carried out with the aim of ensuring that the views of all of those parties were considered during the CDS development.

5.1 Initial consultation

An initial round of written consultation was completed in May 2006. The primary purpose of this stage was to obtain available information on issues relevant to the study area. A letter was sent to a number of key consultees, including statutory organisations on 9th May 2006 together with a 4-page scoping document providing background to the study (see **Appendix G**).

Many organisations and individuals were identified by the Steering Group and consulted during the strategy development. Residents groups in Southampton were contacted through Southampton City Council's Neighbourhood Partnership programme. A full list of those organisations consulted is provided in **Appendix H**.

Table 6 identifies some of the issues on which views were sought, although this list is not exclusive.

Table 6: Initial consultation suggested topic areas

Initial consultation suggested topic areas
Coastal Processes
<ul style="list-style-type: none">▪ historical evolution▪ physical characteristics (e.g. landscape, geology, geomorphology)▪ present day processes (e.g. waves, tides, sediments)▪ inter-relationships with the adjacent coastline▪ effects of sea level rise and potential increases in storm frequencies▪ predictions of future coastline evolution▪ ongoing monitoring
Coastal Defences
<ul style="list-style-type: none">▪ ownership of/responsibility for coastal defences

Initial consultation suggested topic areas

- existing and currently planned defences
- location
- condition
- effectiveness
- standard of service provided
- maintenance policy
- current rates of erosion and accretion
- areas at risk from flooding or erosion
- analysis of pressures

Natural Environment

- identification of areas or features of conservation interest and designations (including biological, geological, geomorphological and landscape interests)
- historical evolution
- present constraints (e.g. legislative)
- current trends (e.g. losses and gains in extent of habitats, species distribution and abundance)
- predicted future trends
- opportunities for environmental enhancement

Initial consultation suggested topic areas

Human and Built Environment

- archaeological and historic features
- historical evolution
- residential/industrial areas and infrastructure
- recreation, tourism and education
- pollution risks
- aggregate extraction
- present constraints (e.g. physical, economic and legislative)
- opportunities for environment enhancement

Planning and Land Use

- current pattern of land use
- predicted future trends (according to existing Structure. Local and Unitary Development Plans)
- other relevant management plans (e.g. estuary or catchment management or AONB management plans, etc.)
- present constraints (e.g. legislative)
- agricultural and fisheries interests
- commerce, ports and harbours, navigation, etc.

Responses to this consultation were requested by 28th May 2006. Summary responses to the consultation are shown in **Table 7** and **Table 8** and more information is provided in **Appendix I**.

Table 7: Summary of areas in which consulted organisations commented as part of the initial consultation

Consultee	Issue / Opinion Raised													
	Coastal Processes	Erosion	Flooding	Drainage	Landscape	Land Use	Ecology / Wildlife	Economy	Fisheries / Fishing	Navigation / Sailing	Access / Recreation / Amenity	Archaeology / Heritage	Water supply / Water treatment	Pollution / Water quality
Statutory Consultees														
Natural England							•							
Local Authorities														
Southampton City Council (Steering Group)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Fareham Borough Council (Steering Group)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Eastleigh Borough Council (Steering Group)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Hampshire County Council	•	•	•	•	•	•	•	•	•	•	•	•	•	•
New Forest District Council	•						•							
Elected Members														
Co. Cllr (Warsash)	Response received but no specific comments.													
Town / Parish Councils and Elected Members														
Hamble-le-Rice Parish Council	•	•				•	•			•	•	•		•
Conservation Bodies / Organisations														
English Heritage											•			
Joint Nature Conservancy Committee	Response received but as a national organisation they are unable to comment on regional / local issues. Issues addressed by Natural England response.													

Consultee	Issue / Opinion Raised													
	Coastal Processes	Erosion	Flooding	Drainage	Landscape	Land Use	Ecology / Wildlife	Economy	Fisheries / Fishing	Navigation / Sailing	Access / Recreation / Amenity	Archaeology / Heritage	Water supply / Water treatment	Pollution / Water quality
Hamble Estuary Partnership	•					•					•			•
Solent Forum	Response received but unable to provide a view on behalf of all member organisations. All members have been consulted individually.													
Solent Protection Society	Response received but no specific comments.													
Landowners / Commercial Interests / Utilities														
ABP Marine Environmental Research Ltd	Response received but no specific comments as are contributing to the CDS development.													
Hamble Oil Terminal	•	•	•			•		•		•				
Netley Cliff Management Company	•	•			•									
Southern Water Services		•					•						•	•
The Towers Management Company		•				•	•				•			
Warsash Residents Association	•	•	•				•			•	•			
Fisheries / Navigation / Recreation / Heritage & Archaeology														
Hampshire & Isle of Wight Trust for Maritime Archaeology											•			

Table 8 below summarises the key points raised in the individual responses received. Where a comment has been made by more than one party, it has been combined for simplicity.

Table 8: Summary of issues and concerns arising from the initial consultation

Issue	Issues / Concerns raised during initial consultation
General comments on the policy options	<ul style="list-style-type: none"> • needs to be tied in to neighbouring strategies • must produce clear and firm recommendations • should cover the tidal range of the Hamble inc. Pubbrook Lakes • Concern about selection of study boundary limit as Bursledon railway bridge and not the tidal limit • must be coordinated with the area to the east of Hook
Coastal Processes	<ul style="list-style-type: none"> • Changes to erosion and sedimentation patterns from new defences • Impact of dredging activities in the river on beach levels / erosion rates e.g. Hamble Point • Observed falling beach levels • Impact of leisure boating structures on the river regime • Need for information on the tidal and fluvial flows • Detailed chart of the shoreline and bottom of the river needed for effective planning and maintenance inc. dredging • Full hydrological survey should take place to show effect of maintenance dredging <p><i>References:</i></p> <ul style="list-style-type: none"> • Strategic Regional Coastal Monitoring Programme • Solent Dynamic Coast Project • Hamble Estuary Management Plan 2003-2008
Flooding	<ul style="list-style-type: none"> • Concern that retreat the line / no protection policy for Hamble Common could lead to flooding of parts of BP Oil site • Flood storage capacity of Hook Lake should be maintained by vegetation clearance to prevent flooding of gardens at Fleet End Road

Issue	Issues / Concerns raised during initial consultation
Drainage	<ul style="list-style-type: none"> • Inadequate drainage culverts from Bunny Meadow leading to erosion of this sensitive site • Maintenance clearance of Hook Lake to maintain flood storage capacity and prevent flooding of gardens at Fleet End Road
Land Use	<ul style="list-style-type: none"> • Commercial development within the Hamble • Lack of infrastructure for new housing (traffic, shops, etc.)
Erosion	<ul style="list-style-type: none"> • Erosion highlighted at a number of sites, specifically: <ul style="list-style-type: none"> - Hamble foreshore, loss of beach - Hamble-le-Rice frontage - bank/cliff erosion along whole frontage - Westfield Common - loss of foreshore - Netley frontage - Failure of existing defences- rock armour protection and beach re-nourishment required - The Towers - Steps and seawall at Netley Court School - Erosion between Warsash Hard and Maritime College - Erosion around water treatment assets • Perceived causes were highlighted as being: <ul style="list-style-type: none"> - Maintenance dredging of the river bed - Effect of wash from shipping - Effect of oyster dredging activity - Effect of dredging of tanker berths - Construction of illegal ad-hoc defences - Disturbance inc. scour from larger / faster vessels • Soft solutions preferred for defences

Issue	Issues / Concerns raised during initial consultation
Landscape	<ul style="list-style-type: none"> • Stretch of shoreline to south of Weston Shore is unattractive due to previous piecemeal attempts to defend the shore • Area would benefit from unified scheme providing valuable amenity for the area • Exposure of roots of shoreline trees due to erosion (many have TPOs) • Exposure of the pipeline from Netley to Hamble-le-Rice and under the river to Warsash
Ecology / Wildlife	<ul style="list-style-type: none"> • Potential of study to impact on designated sites • Important to maintain and improve designated sites • Loss of saltmarsh • Areas outside the SPA which are important for Brent Geese (an SPA feature). • Defences should only be considered if proposals do not damage the environment <p><i>References:</i></p> <ul style="list-style-type: none"> • Citations for designated sites • Hampshire Biodiversity Information Centre • Brent Goose Strategy South Hampshire Coast (2002) • WEBS data • Solent Dynamic Coast Project • Solent European Marine Site management plans
Economy	<ul style="list-style-type: none"> • BP Oil terminal • Commercial development within the Hamble • Security of private property (i.e. erosion / flood protection)
Fisheries / Fishing	<ul style="list-style-type: none"> • Lack of facilities for visiting sailors at Warsash Hard inc. shops, parking, etc.

Issue	Issues / Concerns raised during initial consultation
Navigation / Sailing	<ul style="list-style-type: none"> • Impact of leisure boating infrastructure on river regime • Disturbance inc. scour from river traffic • Lack of facilities for visiting sailors at Warsash Hard inc. shops, parking, etc.
Water supply / Water treatment	<ul style="list-style-type: none"> • Strategic assets in the study area, including <ul style="list-style-type: none"> - Bursledon Treatment Works - Woolston Wastewater Treatment Works - Portswood Wastewater Treatment Works - 16 Combined Sewer Outfalls • Practicalities of relocating assets - including objections to siting assets within existing conservation designations
Access / Recreation / Amenity	<ul style="list-style-type: none"> • Existing Rights of Way – e.g. rights of way on Westfield Common, Hamble Common and Southampton Water foreshore • Potential / existing use of defences as footpaths • Erosion threats to Hamble Point Car Park • Public safety – hazards posed by decaying defences • Loss of access to foreshore e.g. path from Beach House, steps at Netley Court School • Sea wall in front of RVCP closed for public access and should be reopened • Shore Path needed for public access and protection of Bunny Meadow wetland. Recreation and education benefits. • Developers should pay for the restoration of footpaths lost to erosion <p><i>References</i></p> <ul style="list-style-type: none"> • Hamble Common Plan

Issue	Issues / Concerns raised during initial consultation
Archaeology / Heritage	<ul style="list-style-type: none"> • 3 nationally important terrestrial archaeological sites (designated SAMs) within study area and at risk from erosion: <ul style="list-style-type: none"> - SP143: Clausentum Roman Site, Bitterne Manor; - No24323: Promontory defined by Iron Age Linear Earthwork and St Andrews Castle, Hamble-le-Rice; - HA7: Netley Abbey, including Netley Castle, Hound • Study area rich in artefacts from many periods e.g. peat layers, buried land surfaces • Presence of exposed or eroding horizons (Upper Palaeolithic and Mesolithic) in intertidal • Intertidal may have high archaeological potential e.g. Medieval and post-Medieval boat building in the Itchen and Hamble • Waterside structures, wharves and landing places • Hulked vessels • Gun emplacement at Hamble Point • Many areas have not been subject of detailed study • Rapid Coastal Zone Assessment required • Any scheme should provide appropriate mitigation measures <p><i>References</i></p> <ul style="list-style-type: none"> • Sussex-Hampshire Marine Corridor Survey • LA Coastal Management Plans • Itchen River Project • Hamble River Project • Survey of the Weston Shore

Issue	Issues / Concerns raised during initial consultation
Pollution / Water quality	<ul style="list-style-type: none">• Pollution from run-off e.g. from M27• Pollution from vessels• Potential pollution from BP Oil terminal• Rotting boats at River Hamble east bank b/t M27 and railway bridge• Fly tipping• Decommissioning of defences built using unknown materials may release contaminants to environment• Flooding of BP Oil terminal if defences are not maintained

5.2 Wider public consultation

The following steps were taken as part of a wider public consultation on draft policy options for the Policy Units:

- Press releases to raise awareness of the strategy, leading to an article in Eastleigh Borough News.
- Public exhibition: Wednesday 25th April 2007 at the Royal Victoria Country Park.
- Website consultation via Eastleigh Borough Council's website.

Public feedback was collated in the form of a simple pro-forma. More information relating to consultation responses received is provided in **Appendix I**.



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6 Understanding the Study Area

This chapter provides a brief overview of some of the history of the study area and describes key features of interest within the study area. It is based upon a review of existing information on the River Itchen, Weston Shore, Netley and Hamble, made available through public documents, reports, assessments and journals, together with information from the Steering Group member organisations, information gleaned from the study team's visits to the study area, and results of ongoing consultation during the strategy development.

6.1 Evolution of the area

The Solent as referred to today is formed from the drowned valley of a river which once flowed eastward, across rock about 40 million years old. It ran between the Isle of Wight and mainland Hampshire and had an icy, tundra landscape.

Towards the end of the last ice age when the glaciers began to melt in the north, a great amount of flood water ran into the Solent River and its tributaries, scouring the estuary deeper. Isostatic rebound in Scotland and Scandinavia has also caused the land in the south to sink over thousands of years as it continues to do so today. The isostatic process has submerged many smaller valleys and created some of the characteristics as we now know as Southampton Water and the River Hamble.

Approximately ten thousand years ago a band of Chalk rock (part of the Southern England Chalk Formation) ran from the Isle of Purbeck area to the eastern tip of Isle of Wight. The mainland behind the chalk rock consisted of sands, clays and loose gravels. Many rivers ran through these weaker soils, including the Dorset Frome in the west and the Stour, Beaulieu, Test, Itchen and Hamble rivers, which created a large estuary flowing west to east and out into the English Channel at the eastern end of the present Solent. This great estuary ran through a wooded valley and is referred to as the Solent River. Eventually the Solent River was flooded and the fragile chalk ridge eroded and the land separated to become the Isle of Wight.

6.2 Landscape

The study area covers the east bank of the River Itchen as far upstream as Woodmill Lane in Bitterne, Weston Shore, Netley and Hamble-le-Rice frontage, and both banks of the River Hamble and ends upstream at Bursledon Railway Bridge.

The River Itchen has comprised, since the late 19th to early 20th century, of mostly industrial areas including the recently demolished ship building facility (now planned for redevelopment) at Woolston. Historic maps show the eastern bank of the Itchen as being predominantly rural before 1848 with urban areas around the tidal dock on the opposite bank. Activities that have shaped the river bank landscape in recent years include marinas, jetties, marine works, wharves, recreational clubs and dockyards. The river now has a predominantly urban landscape on both edges which contains residential, industrial and commercial properties. Further north towards Woodmill is only significant open park area at Bitterne which also shares the same stretch of river with a medium sized wastewater treatment site.

Weston Shore is approximately 2.2km long and has been predominantly rural in the past with a small fishing community present and references to the area exist as far back as the 10th Century. The landscape today has an even split of residential properties and park areas fronted by a shingle foreshore and intertidal mudflats which are now a designated Site of Special Scientific Interest (SSSI). The landscape remains similar further to the east but with a vegetated shingle bank backed by wooded areas around Netley Castle.

The shoreline in the Netley area has a low eroding cliff with intermittent hard coastal defence structures designed to protect the immediate residential properties and historic buildings. Netley is dominated by the Royal Victoria Country Park which was once home to a large military hospital. Other features include the villages of Netley and Hamble-le-Rice, expanses of agricultural land, woodlands, open recreational land and grassland at Weston Shore, sailing and boating areas at Southampton and Netley and an industrial area at the southern end of the unit.

The Hamble estuary, situated 6km south-east of Southampton's city centre, is recognised as one of the largest recreational yacht and boating centres in Europe. The estuary discharges into Southampton Water and has a large area (approximately 200ha) of nationally and internationally protected mudflats and saltmarsh. The lower Hamble has 14 boatyards with approximately 3000 moorings shaping the frontage of both banks with inland residential and commercial areas in the Warsash and Hamble villages. The area to the north of the M27 Motorway Bridge on the estuary is recognised as the upper Hamble area, and in contrast to the lower, is mostly rural with very little development. The west bank on the upper Hamble is dominated by the Manor Farm Country Park.

The Lower Hamble Estuary contains agricultural land, saltmarshes, woodlands and mudflats. The character of the Hamble landscape is predominantly rural. The unit also contains wide areas of saltmarsh, and mudflats with woodland above, which add to the natural ambience of the landscape. Wide areas of mudflat form an essential component of the landscape. Woodland is the predominant feature when viewed from the sea.

The eastern margin is even less developed and contains hills, which are mostly covered with deciduous and coniferous woodlands. The coast in the area consists of a mixture of saltmarshes, mudflats and shingle. The overall character of the landscape within the policy unit could be summarised as wooded and natural, though there are a few villages, such as Swanwick, Warsash and Hamble.

6.3 Ecology / Wildlife

The coastlines of the North West Solent have extensive shallow areas of intertidal mudflats and marshes. The ecological interest is centred mostly on the intertidal mudflats between Bitterne Wharf and Weston Point which are recognised as being of national and international importance for conservation. The mudflats and marshes around these intertidal zones contain sediments high in organic matter which make them significantly productive in biological terms.

The rich intertidal zone supports a great number and diversity of species including benthos like the hard shell clam *Mercenaria mercenaria*. Successfully introduced to the south coast in 1925 from the United States, Southampton water now has the largest remaining population of *Mercenaria mercenaria* in Britain. Green algae are also present in abundance in the intertidal zone including *Ulva lactuca* and *Enteromorpha spp.* Other flora and fauna includes *Spartina* which provides an important feeding ground for waders and dark-bellied Brent geese (*Branta bernicla*).

The Hamble estuary provides a grazing marsh reclaimed from saltmarshes in the 17th Century (the Hook Links area). There is also the freshwater fleet (Hook Lake) with deciduous woodland extending inland. The marshes are dominated by:

- *Agrostis*;
- *Festuca*;
- *Hordeum secalinum*; and

- *Alopecurus pratensis*.

The nationally scarce slender hare's-ear occurs on the seawall. Hook Links supports breeding lapwing (*Vanellus vanellus*), oystercatcher (*Haematopus ostralegus*) and redshank (*Tringa tetanus*) and is an important mid- and late-winter feeding ground for Brent geese.

The woodland is of ancient origin and is dominated by *Alnus glutinosa*, grading into mixed oak (*Quercus robur*), with ash (*Fraxinus excelsior*), birch (*Betula*) species and sycamore (*Acer pseudoplatanus*) woodland on the higher slopes.

Mudflats from Bitterne Wharf to Weston Point are recognised as national and internationally important for nature conservation.

Other habitats of significance include the woodlands further inshore, acidic grasslands and wet heath at Hamble Common, and areas of fen and marsh. Grassland at Weston Shore has roost areas for birds at high tides. Bird species include black-tailed godwit (*Limosa limosa*) and dunlin (*Calidris alpina*).

Hamble Common includes a mosaic of acidic grassland and wet heath that forms a small area of semi-natural habitat close to the intertidal zone. Lincegrove and Hackett's marshes, on the west bank of the river, consist of a mature saltmarsh. The marshes are elevated to about MHWS and are dissected by complex patterns of drainage creeks. The saltmarsh vegetation is dominated by sea purslane (*Atriplex portulacoides*) and common cord-grass (*Spartina anglica*). Other saltmarsh species form a mixed community on the higher marsh levels.

6.4 Land Use

The waterfront from Quayside Road to Cobden Bridge on the east bank is largely residential. There are a few industrial uses, such as the Centurion Park, built on reclaimed land. Developments are a mix of industrial, commercial and residential uses, with most of the frontage situated on low-lying reclaimed land.

Weston Point along Weston Shore is predominantly recreational open space. Westwood Woodland Park is an area of ancient woodland providing a 'green gap' between the urban areas of Weston and Eastleigh.

Netley and Hamble are the two main settlements on the frontage. Netley is predominantly residential with two local shopping areas. Land use in the lower Hamble area is dominated by the boat building and marina activities with supporting infrastructure such as boat yards and dry docks. The upper Hamble is mostly untouched with wooded areas on both banks that offer popular walking routes.

6.5 Economy

A traditional industry on the River Hamble is boat-building. Boatyards have been a feature of the river for centuries. Their role in building vessels has declined considerably and today the yards are used for repair and maintenance of existing boats. It still remains an important local industry however, and four sites have been allocated on the west bank to ensure any future development is boat related. The marina activities in the River Hamble are also regarded as providing a significant economic contribution to the local area.

An important feature of the study area's economy is the Oil Terminal at Hamble, owned and managed by BP, which is a fuel storage and distribution centre that employs approximately 80 people. The

terminal has been part of the village of Hamble for more than eighty years. The village has gradually expanded around the Terminal to a point where the installation is now at the centre of the community.

The Woolston District Centre also plays a role in the area as an important economic feature. Although the vacation of the Vosper Thornicroft ship building facility, once a major employer for the area, has seen a decline in the local economy, the Woolston District Centre has managed to continue.

6.6 Access & Amenity

The River Hamble is internationally renowned for yachting as it is well-placed for sailing to all parts of the Solent. Its moorings lie in sheltered water and are accessible at all states of the tide. Consequently, sailing attracts many tourists and is therefore important to the local economy. Marinas have been developed on the river at Hamble Point, Port Hamble, Mercury Marina at Hamble-le-Rice, Swanwick Marina and the Universal Marina at Sarisbury.

To retain the relatively open stretches of the river and enable views across, there are a number of mooring restriction areas along the river. This also ensures that the number of craft berthed in the river does not exceed 3,261, the maximum for reasons of navigational safety.

Recreation, amenity and tourism have vital parts to play in this policy unit. Much of the local tourism industry relies on the attraction of the River Hamble for sailing enthusiasts. Other water-based attractions include angling, canoeing, sailboarding and jet-skiing.

Along this attractive coastline, walking is a popular recreation and as such improvements are being made to various forms of access to the coast. For example, it is now possible to walk along the river bank from Warsash to Lower Swanwick. Bird watching is also a popular activity, the rich intertidal marshes and mudflats supporting large numbers of wildfowl and waders. There are many archaeological features and artefacts around the River Hamble, which attract a great deal of outside interest.

Other areas of recreational and amenity value include Riverside Park, Bitterne Manor and Chessel Bay. Visitors are attracted by landscape and nature conservation value. The Royal Victoria Country Park, south east of Netley Abbey, which is managed by Hampshire County Council, can be considered to be the main attractor of visitors to the area. Weston Shore is primarily used by local residents providing a recreation and amenity area and has a potential to become a major urban ecological park.

6.7 Archaeology / Heritage

Modern Southampton grew from a Saxon settlement established on the edge of a natural harbour at St Mary's when rivers were the main routes inland and trade thrived on their banks.

Itchen's earliest settlement is the Roman Town of Clausentum, known as Bitterne Manor. Bitterne Manor was associated with the Saxon shore forts established to defend Britain from Saxon invaders during the 4th Century. A Norman/Saxon cemetery lies to the south of Bitterne Manor. Over 200 finds have been recovered from this area, many of which are of Palaeolithic origin.

Four Scheduled Ancient Monuments (SAMs) are located within the study area:

- Netley Abbey;
- Netley Abbey aqueducts;
- Netley Abbey wall and moat; and

- Netley Castle.

Tickleford Gully, south west of Weston shore is also of archaeological importance.

The coastline is almost linear and fronted by gently shelving beach making it less conducive for landing therefore there is less evidence of historic settlements. Prehistoric horse scapula and vertebrae have been recovered from clays in the undeveloped intertidal zone south of Weston Point, indicating remains of a buried pre-historic landscape.

The area between Hamble Oil Terminal and Hamble Common Point is rich in archaeological material and is a designated SAM. Monuments include St Andrews Castle and the remains of the moat (1543-1544), an Iron Age linear bank and ditch, a medieval sub-rectangular enclosure and a 19th Century Napoleonic Gun Battery comprising part of an earthwork enclosure.

On the southern most section of the western shore (HAM1) evidence of early occupation at the river mouth is clear on Hamble Common. This is a protected area with structures dating back to the Iron Age. Travelling up the river relatively few identified sites are evident. Documented sites include three salt working sites; one at Warsash, another to the north on the east side of the river, south of Swanwick and the third back towards the mouth of the river below Hook Point. Although this site appears just beyond the limits of HAM8 it is one of the oldest in the region, dating back to the Iron Age.

To the north of the HAM1 policy unit boundary, the remains of Henry V's ship the 'Grace Dieu' lie buried in the mud flats. This vessel is of great archaeological significance and as such is designated under the Protection of Wrecks Act 1973. These ship remains are indicative of the maritime traffic that has been active in these waters for centuries, but despite this, very little is recorded on the archaeological record. Verbal references to a number of undocumented sites have been received during the course of this research. These include a couple of old 'Crabbers', a few vessels dating to WWII and an Isle of Wight ferry. However, further investigation is required to quantify the information.

6.8 Fisheries

A small but active commercial fishing fleet operates from the River Hamble. Fishing and oyster bed dredging is usually carried out in Southampton Water with the majority of the catch being landed at Warsash.

6.9 Navigation / Sailing

There are many sailing clubs, varying in size, located in and around the study area. The Hamble River is an internationally renowned location synonymous with leisure sailing and the sport of yacht racing.

ABP Harbour Authority is the Statutory and Competent Harbour Authority for the Port of Southampton and controls navigation throughout Southampton Water. Navigation through the River Hamble is under the control of the River Hamble Harbour Authority and is managed by Hampshire County Council's Culture, Communities and Rural Affairs department.

The Warsash Maritime Academy, situated on the mouth of the Hamble, provides training, consultancy and research to the maritime industry and students.

6.10 Physical Processes

A number of additional studies have been undertaken in this study. These are described in **Section 3.5**. Coastal processes within the study are described in **Section 4.2** of this report. A review of the existing defences was undertaken and is described in **Section 4.4**.

6.11 Coastal Erosion

Much of the undefended coastline is characterised by intertidal mudflats and marshes, these are generally stable and erosion rates are very low. In places there is even accretion occurring. Other parts of the study area are characterised by low, soft cliffs along undefended sections of the rivers. The erosion of the soft cliffs within the study area is described in **Section 4.5** of this report.

6.12 Flood Risk

Flood risk for land immediately behind each Policy Unit frontage has been assessed using information from the coastal processes and estuary regime modelling results. The zones at risk of tidal inundation are shown on maps provided in Figures 21 to 36. These have been cross-checked with the Environment Agency's Flood Zone Maps (2006) and have been found to be broadly consistent. The flood risk has been described for each Policy Unit in **Section 9** together with a discussion of policy options for each Policy Unit.

7 Environmental Assessment

The report has been developed in accordance with current environmental regulations. Natural England has been consulted throughout the development of the methodology for the environmental assessments, and during the selection of preferred policy options.

7.1 Strategic Environmental Assessment

The Strategic Environmental Assessment (SEA) environmental report (see **Appendix J** for the full report) forms part of the decision making process and assists in guiding the options in this study and the development of recommended policy options.

Under European Directive 2001/142/EC all authorities must carry out an SEA of new plans in certain areas, including policy governing the management of the coast. The Directive is transposed in England through the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004 No. 1633). National guidelines for preparing an SEA have been issued by the former Office of the Deputy Prime Minister (ODPM) and by the consultation bodies: Environment Agency, Natural England and English Heritage.

SEA is a process to ensure that the environmental impacts of plans are considered from the earliest stage, and that significant negative impacts are identified, assessed, mitigated, communicated to decision makers and monitored. The stated objectives of the SEA Directive are to:

- Provide for a high level of protection of the environment; and
- Contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to the promotion of sustainable development.

7.2 Habitats Regulation Assessment

The requirement to undertake assessment under the Habitats Regulations is set out in the Habitats Directive (Council Directive 92/43/EEC) which requires the assessment of plans or projects affecting Natura 2000 sites. Article 6(3) establishes the requirement for Habitats Regulations Assessment (HRA).

The HRA Screening is the first stage in the assessment of the River Itchen, Western Shore, Netley and Hamble coastal policy options to meet the requirement of the Habitats Regulations.

The HRA Screening report was completed for the CDS in May 2008. This identified the Natura 2000 sites which needed to be taken forward to the second stage of the Habitats Regulations Assessment, the Appropriate Assessment. Of the sites considered, four were “screened in” including Solent & Southampton Water Ramsar, Solent & Southampton Water Special Protection Area (SPA), the Solent Maritime Special Area of Conservation (SAC) and the River Itchen SAC.

The HRA Screening report also included a cumulative assessment which identified all of the potential policies which may, in combination with the recommended policy options, impact the Natura 2000 sites.

The Appropriate Assessment was completed for the in April 2009. It considers the impact of the on the integrity of the European sites, alone and in combination with other projects or plans, with respect to the sites’ structure and function. The full Appropriate Assessment is located in **Appendix K**.



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8 Selection of Policy Options

Flood and coastal defences to reduce flood or erosion risk must be technically sound, economically viable and environmentally acceptable. To achieve these objectives it is necessary to take a strategic approach to option identification and evaluation.

This section describes the main guidance used in identifying, and then selecting suitable policy options for each of the Policy Units within the study area. The consideration of each of these policy options for each Policy Unit is described in **Section 9** with the Economic Appraisal of each preferred policy option detailed in **Section 10**. The recommended policy options for each Policy Unit, are presented in **Section 11** and actions required in the next 20 years to implement the recommendations are detailed in **Section 12**.

8.1 Generic Policy Options

The strategic Policy Options are identified for the sections of the coast to determine if it is possible to defend it, and by what means. A number of broad, generic policy options exist, which are defined in **Table 9** below. (Note: In recent years, policy option names have been changed to reflect a change in approach to coastal management. The definitions of each policy option remain largely the same).

Table 9: Generic Policy Options – general definitions

Previous Policy Name	Current Policy Name	Definition
Do Nothing	No Active Intervention	Let nature take its course – no work will be carried out to maintain or repair defences, allowing them to deteriorate over time.
Hold the Line	Active Intervention To hold the line by maintain, sustain or improve sub-options	Maintain – defences are maintained as they are, but as sea levels rise, flood and erosion risks increase over time. Sustain – defences are raised and strengthened keeping the levels of flood and erosion risk the same as now. Improve – defences are improved to increase the standard of protection over time, beyond the requirements of rising sea levels.
Retreat the Line	Managed Realignment	Improve coastal stability by moving coastal defences to a more sustainable location further inland, allowing controlled flooding to occur.

Previous Policy Name	Current Policy Name	Definition
n/a	Adaptive management	Managing complex areas by monitoring changes and acting on them in a planned but flexible way, increasing our understanding over time.

Each of the policy options listed in Table 9 is tested using the Flood and Coastal Project Appraisal Guidance (MAFF/DEFRA, 1999) to determine which is the most suitable for a particular section of the coastline.

A number of factors are considered in this assessment, as discussed in **Sections 8.2 to 8.4** below.

8.2 Determining Flood Risk

It is important to establish the current and future risk of flooding to land adjacent to the coast.

In the study, detailed modelling was undertaken of Southampton Water to provide a more accurate assessment of land at risk from inundation by the sea. This allows us to develop a more thorough understanding of the present day scenario of flood risk, and to inform the development of an understanding of future flood risk, in response to climate change.

The models developed are described in further detail in **Section 4** (full reports are available in **Appendix C** and **Appendix D**). These models have enabled detailed inundation maps to be developed for the study area (see Figures 21 to 36).

To validate the model, comparisons were made with the latest Environment Agency Flood Risk Maps available at the time (Environment Agency Flood Zones, June 2006¹). The two were found to be broadly similar.

In our consideration of flood risk, the 2006 Flood Zones have been used to describe the risk of flooding in each area, whilst the modelled data has been used to calculate area, and hence assets, at risk of flooding.

Below is an explanation of the 2006 Flood Zones used for this study:

Zone 1: land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).

Zone 2: land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Zone 3: land assessed as having greater than a 1 in 100 annual probability of river flooding (>1%) or greater than a 1 in 200 annual probability of flooding from the sea (>0.5%) in any year.

¹ Note: Since the study, new planning guidance† has emerged and there have been updates to the Environment Agency's Flood Maps. This new data was published after the assessments were completed for this study and therefore have not been considered in its assessment.





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Figure 21: ITCH3 modelled flood scenarios



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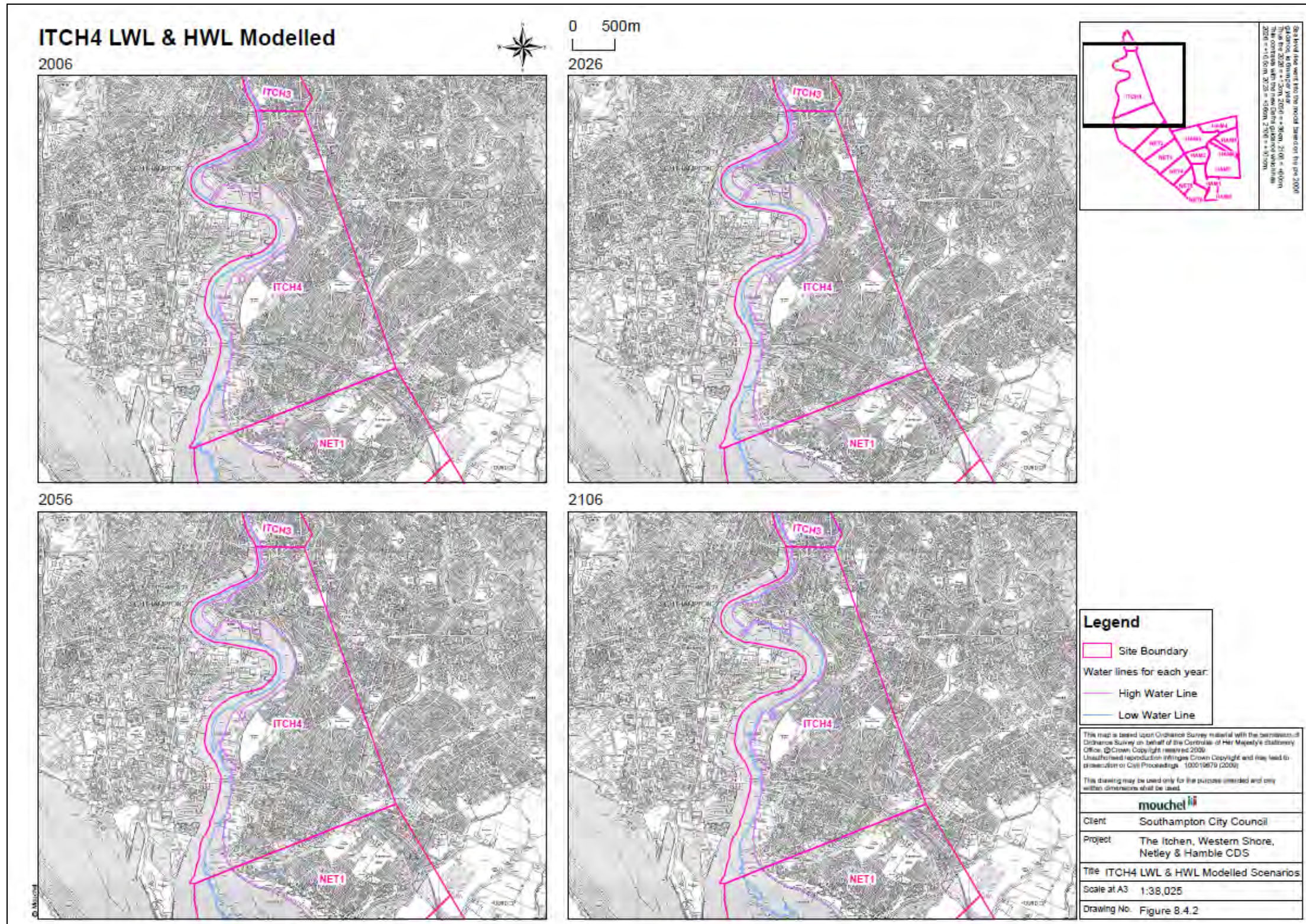


Figure 22: ITCH4 modelled flood scenarios



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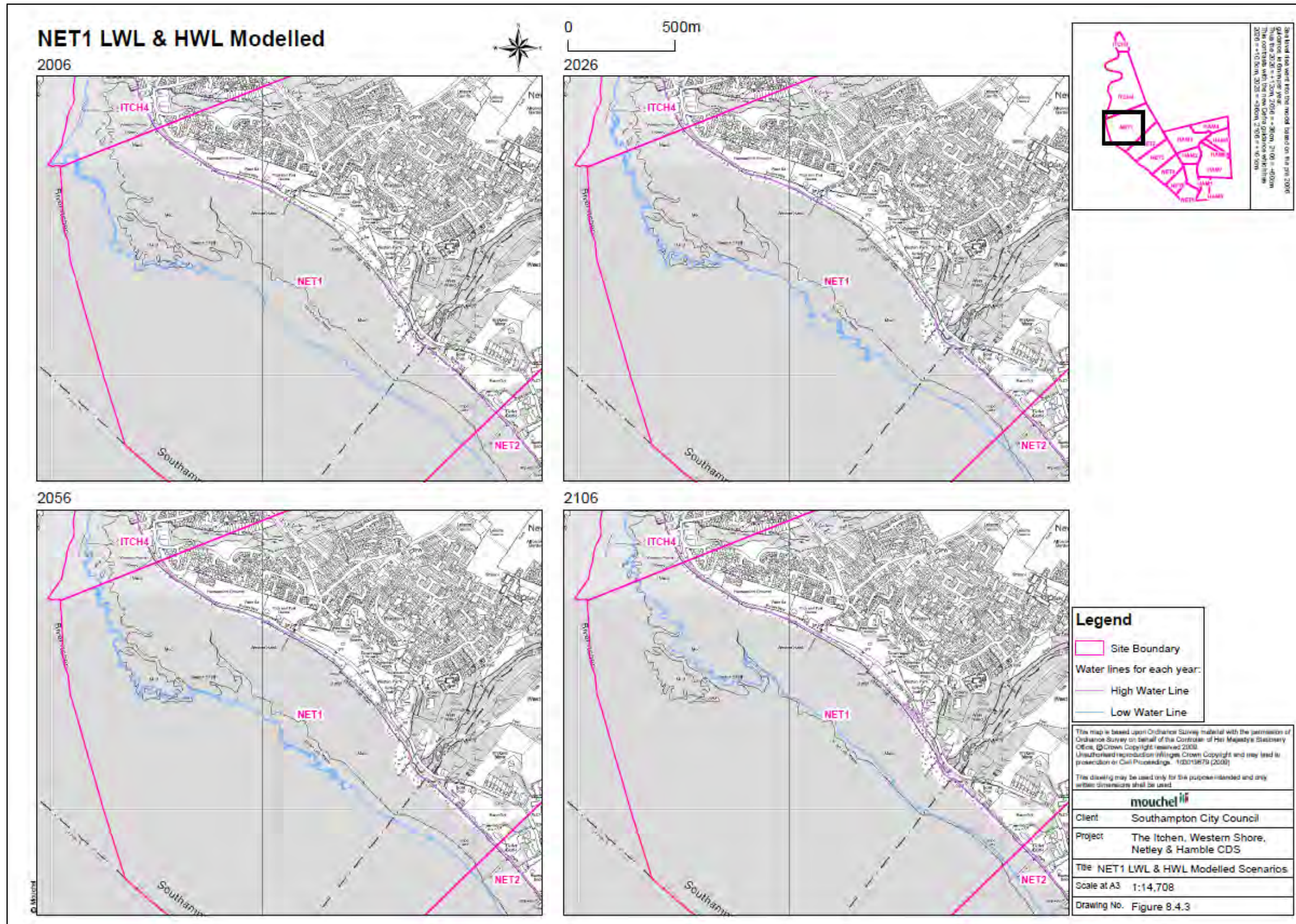


Figure 23: NET1 modelled flood scenarios



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Figure 24: NET2 modelled flood scenarios



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Figure 25: NET3 modelled flood scenarios



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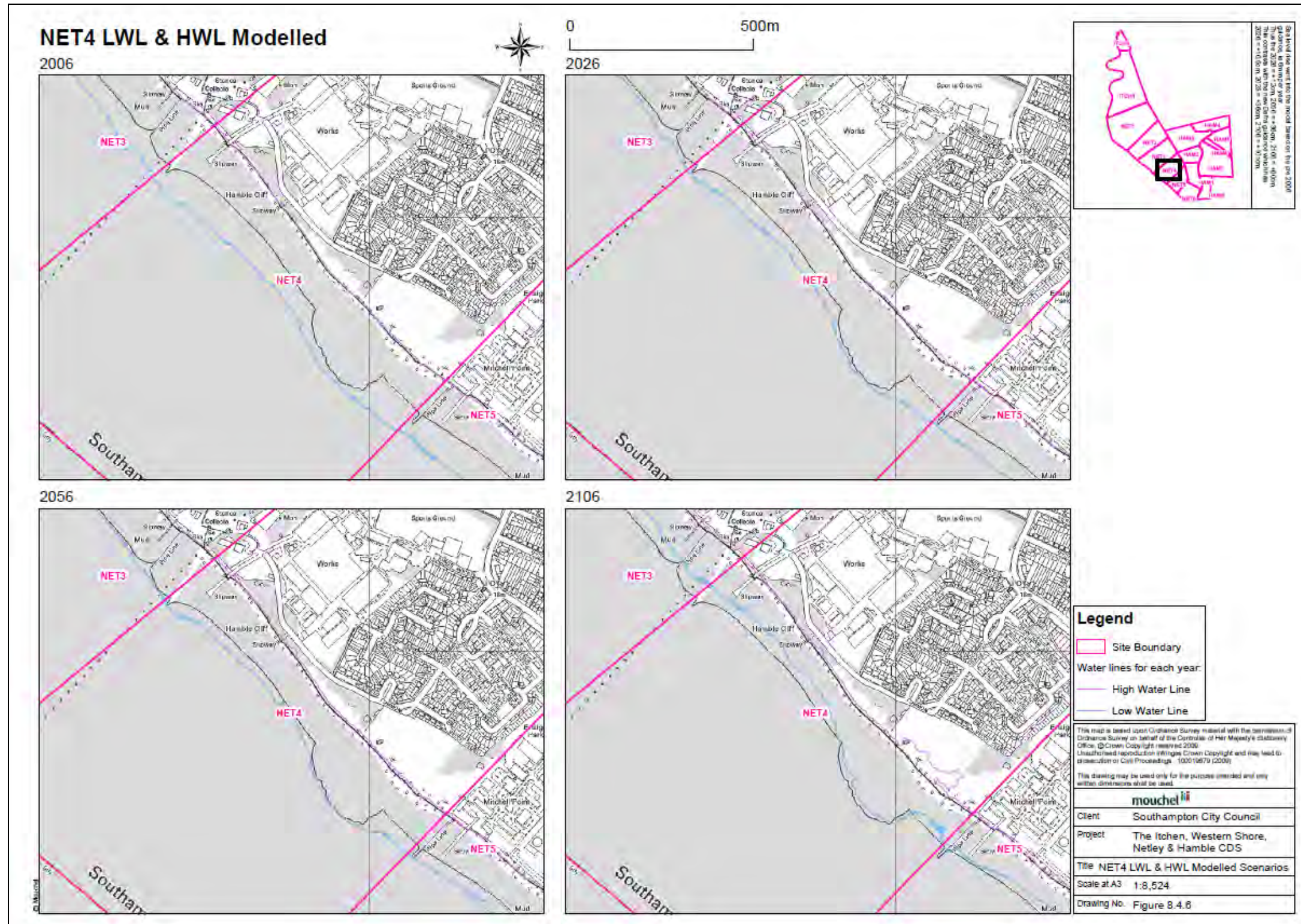


Figure 26: NET4 modelled flood scenarios



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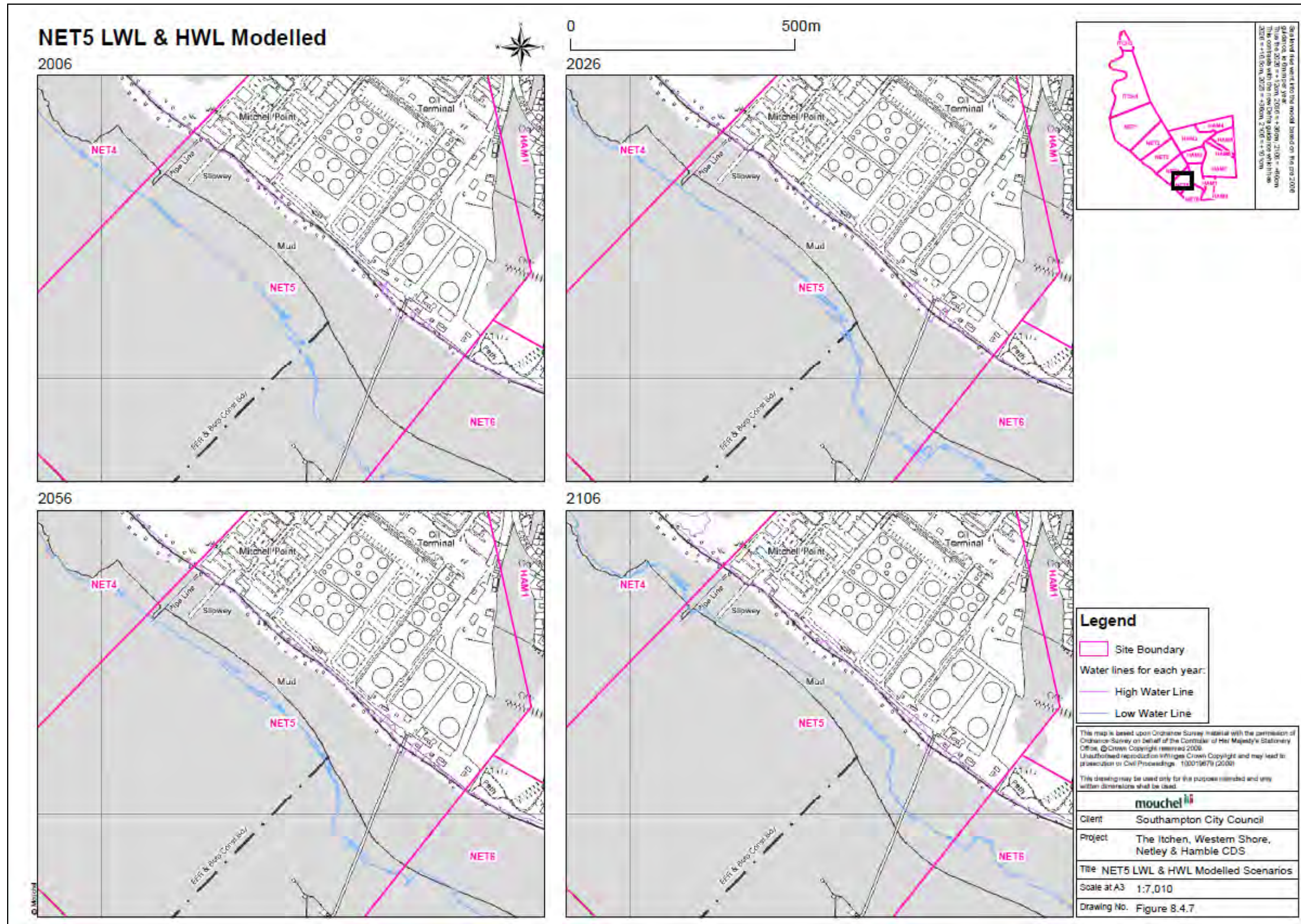


Figure 27: NET5 modelled flood scenarios



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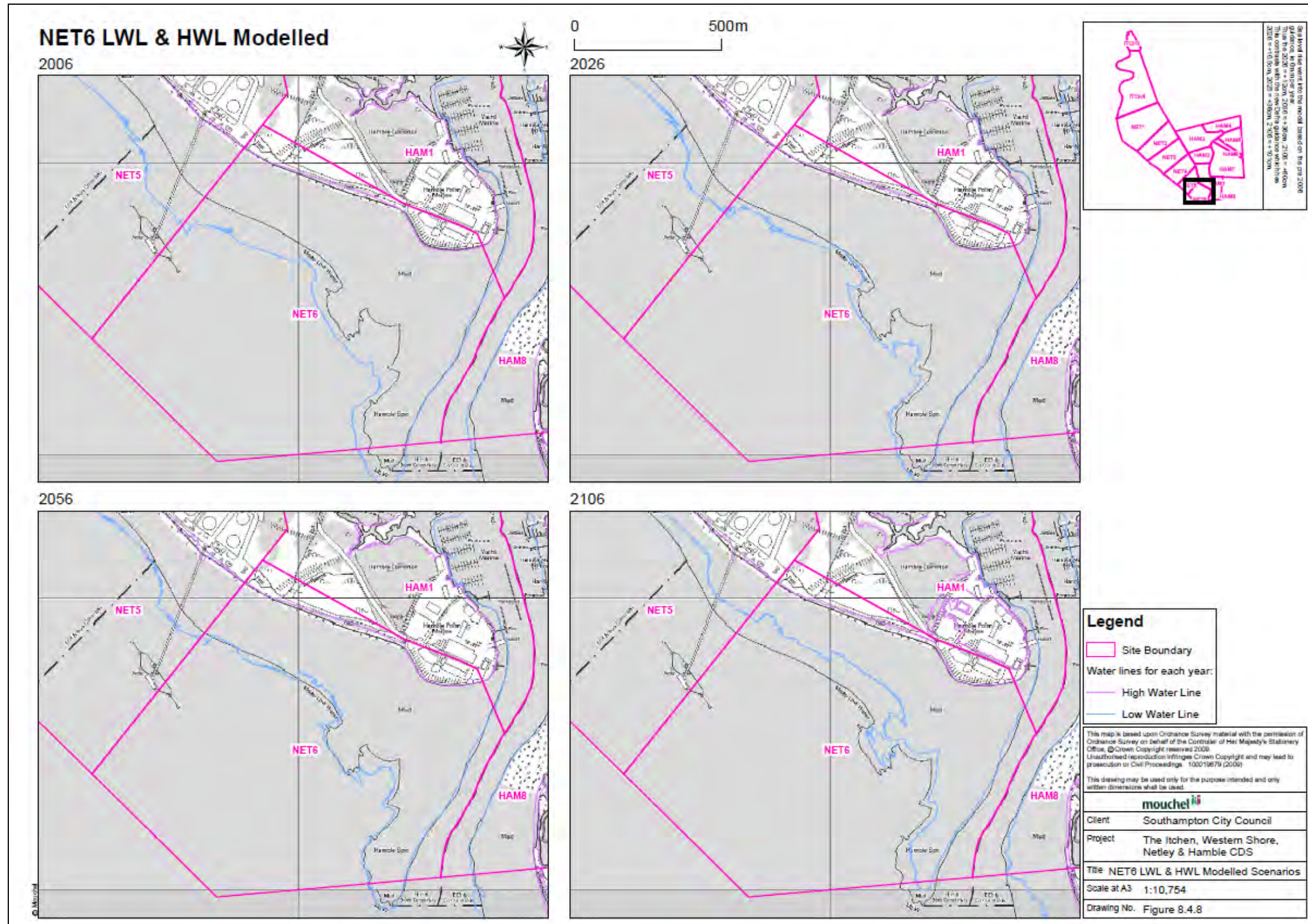


Figure 28: NET6 modelled flood scenarios



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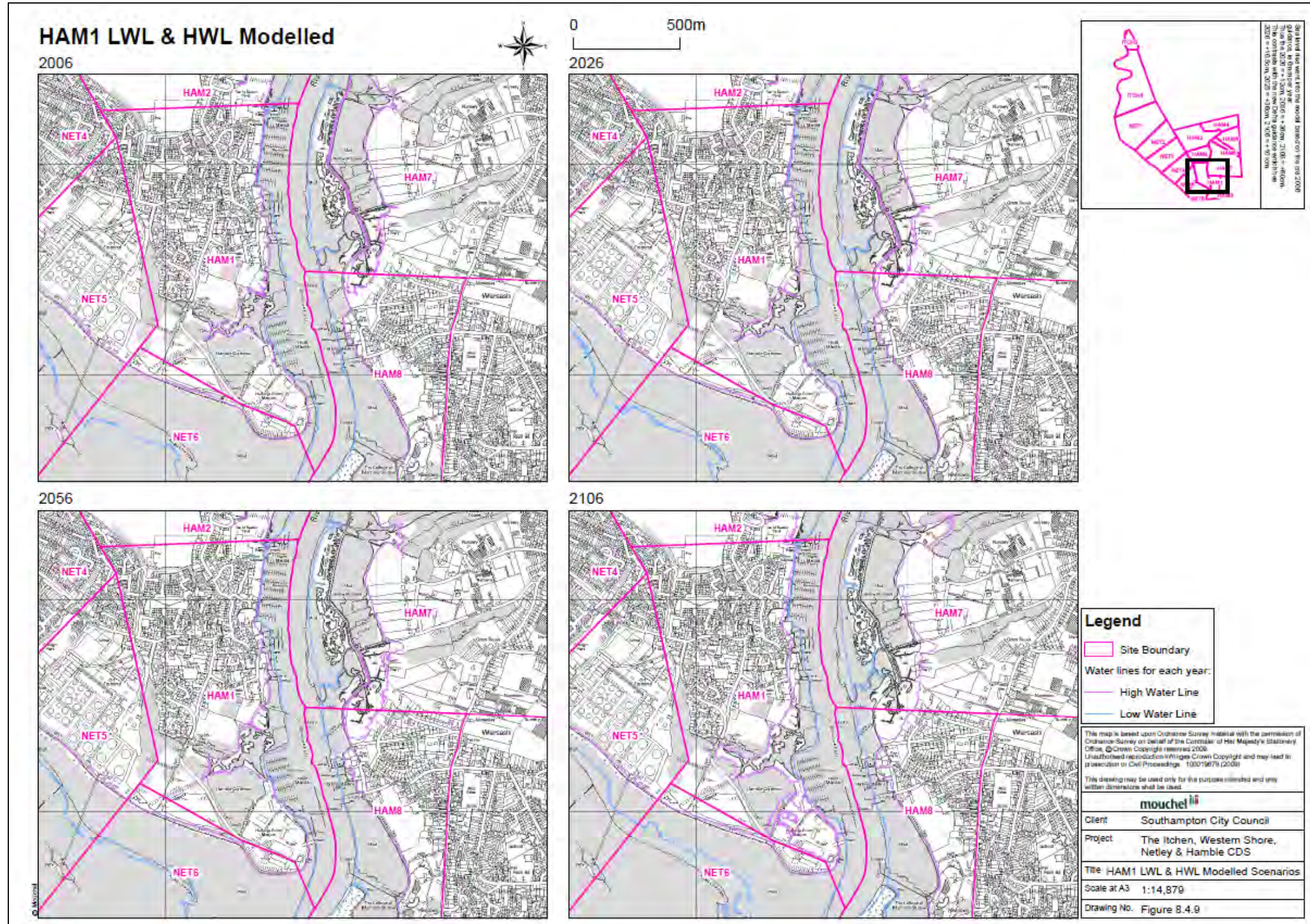


Figure 29: HAM1 modelled flood scenarios



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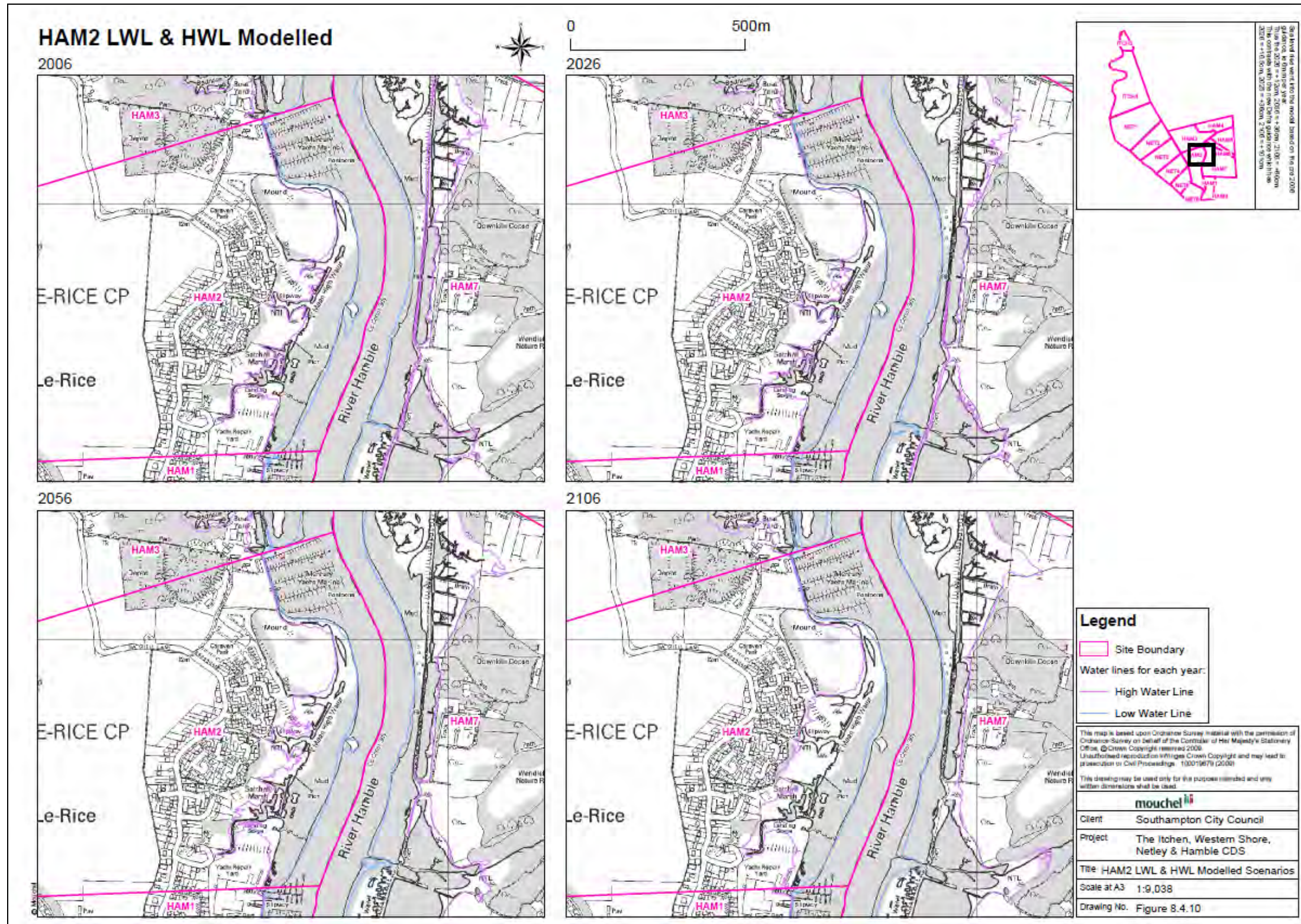


Figure 30: HAM2 modelled flood scenarios



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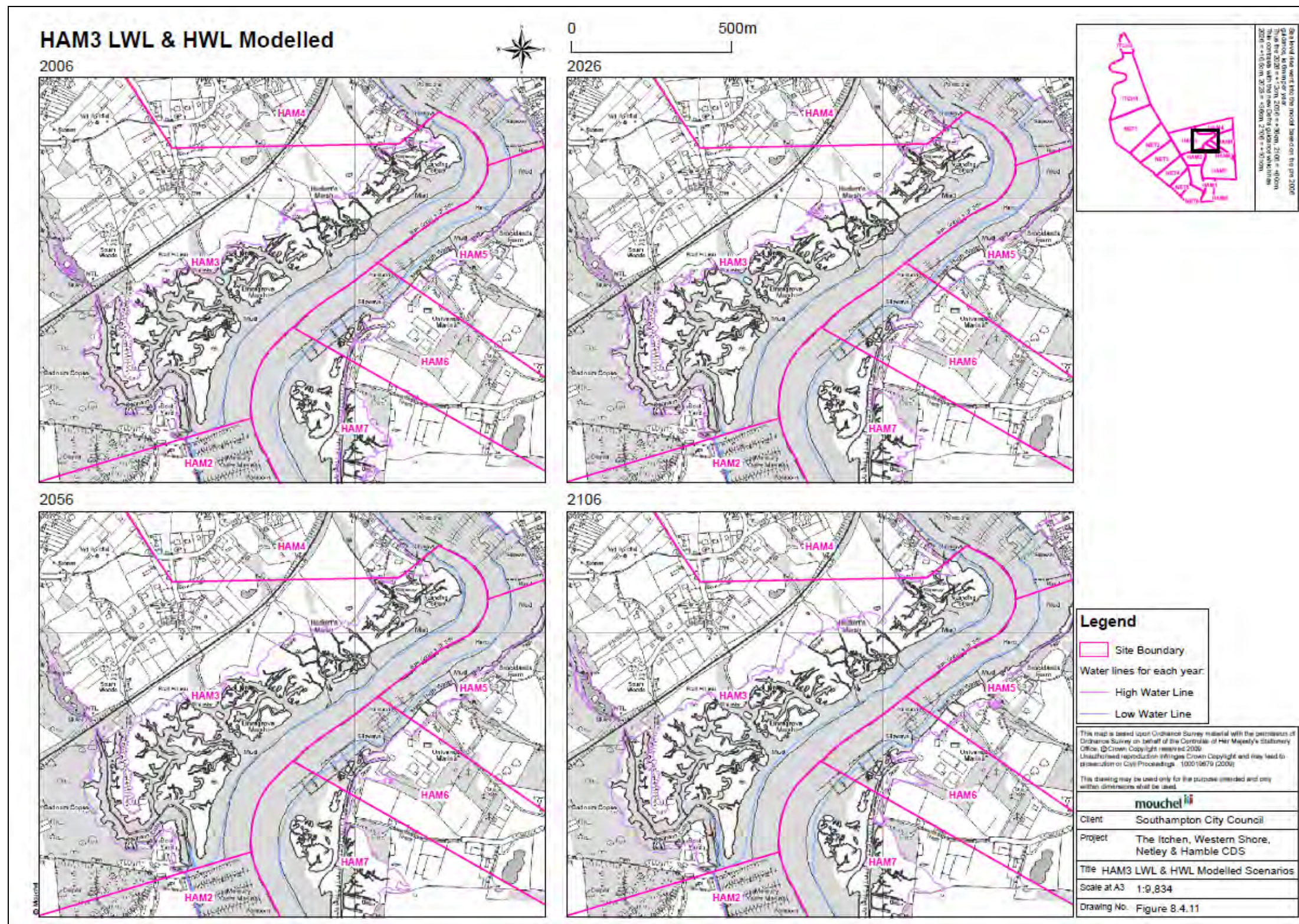


Figure 31: HAM3 modelled flood scenarios



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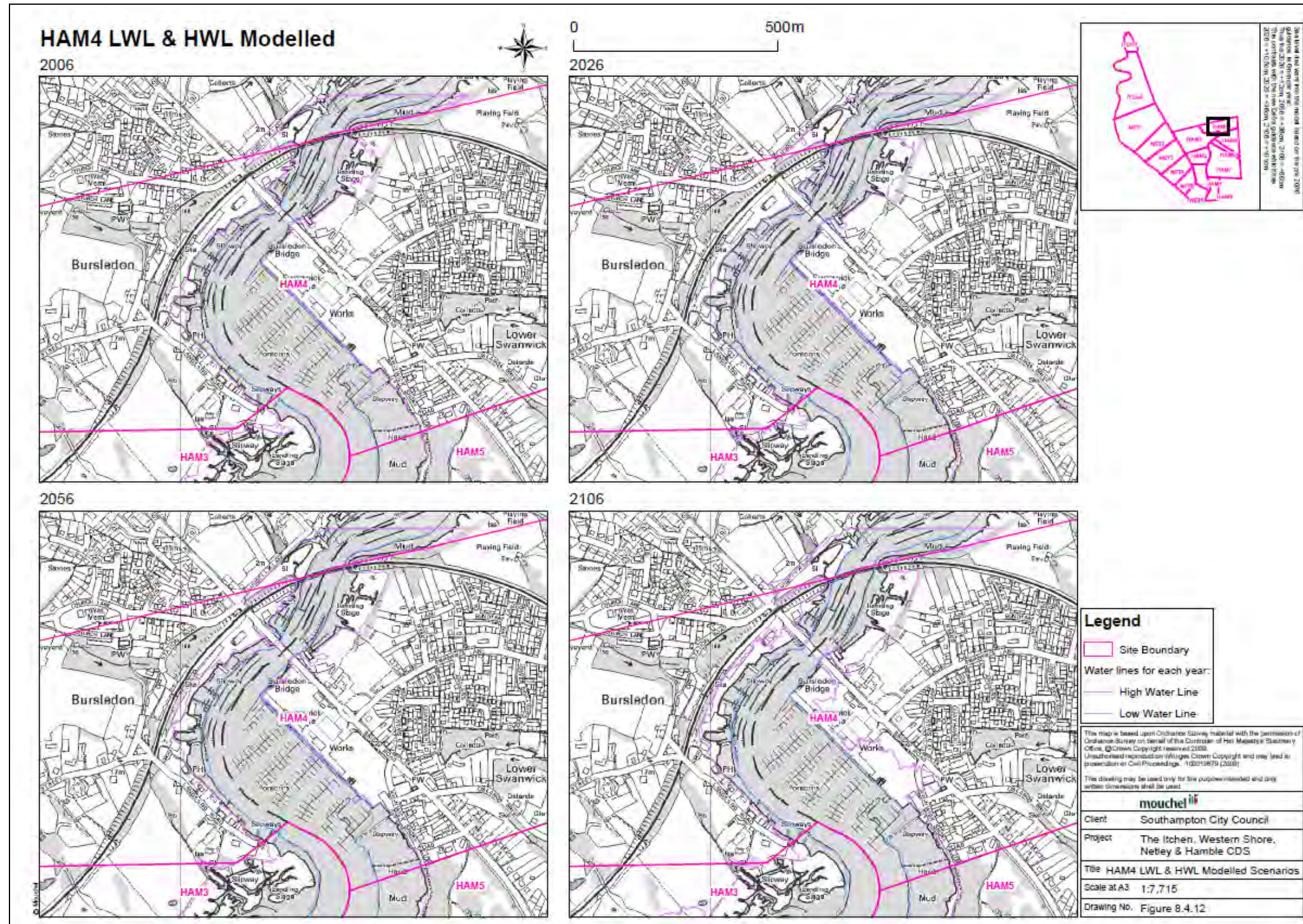


Figure 32: HAM4 modelled flood scenarios



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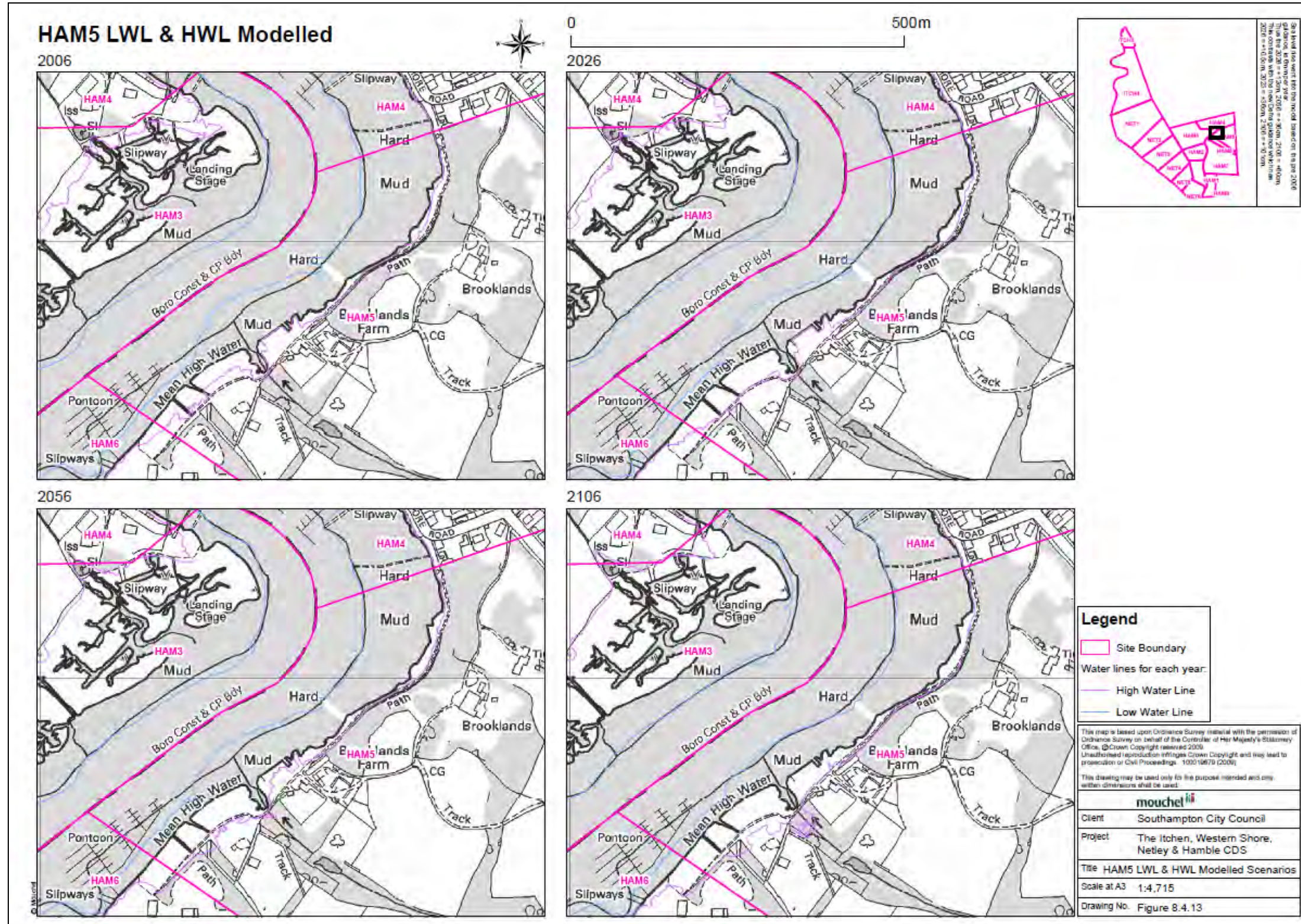


Figure 33: HAM5 modelled flood scenarios



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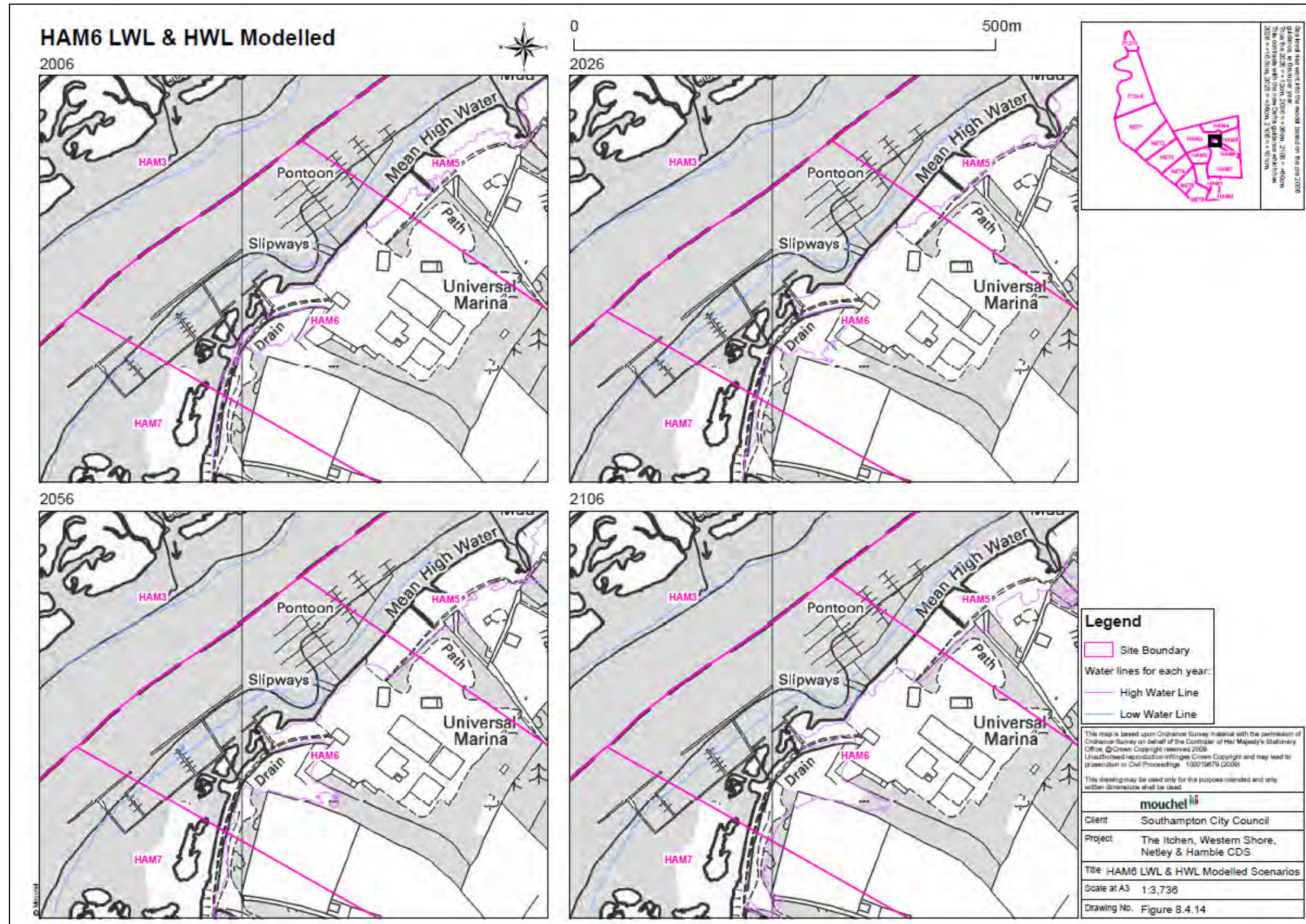


Figure 34: HAM6 modelled flood scenarios



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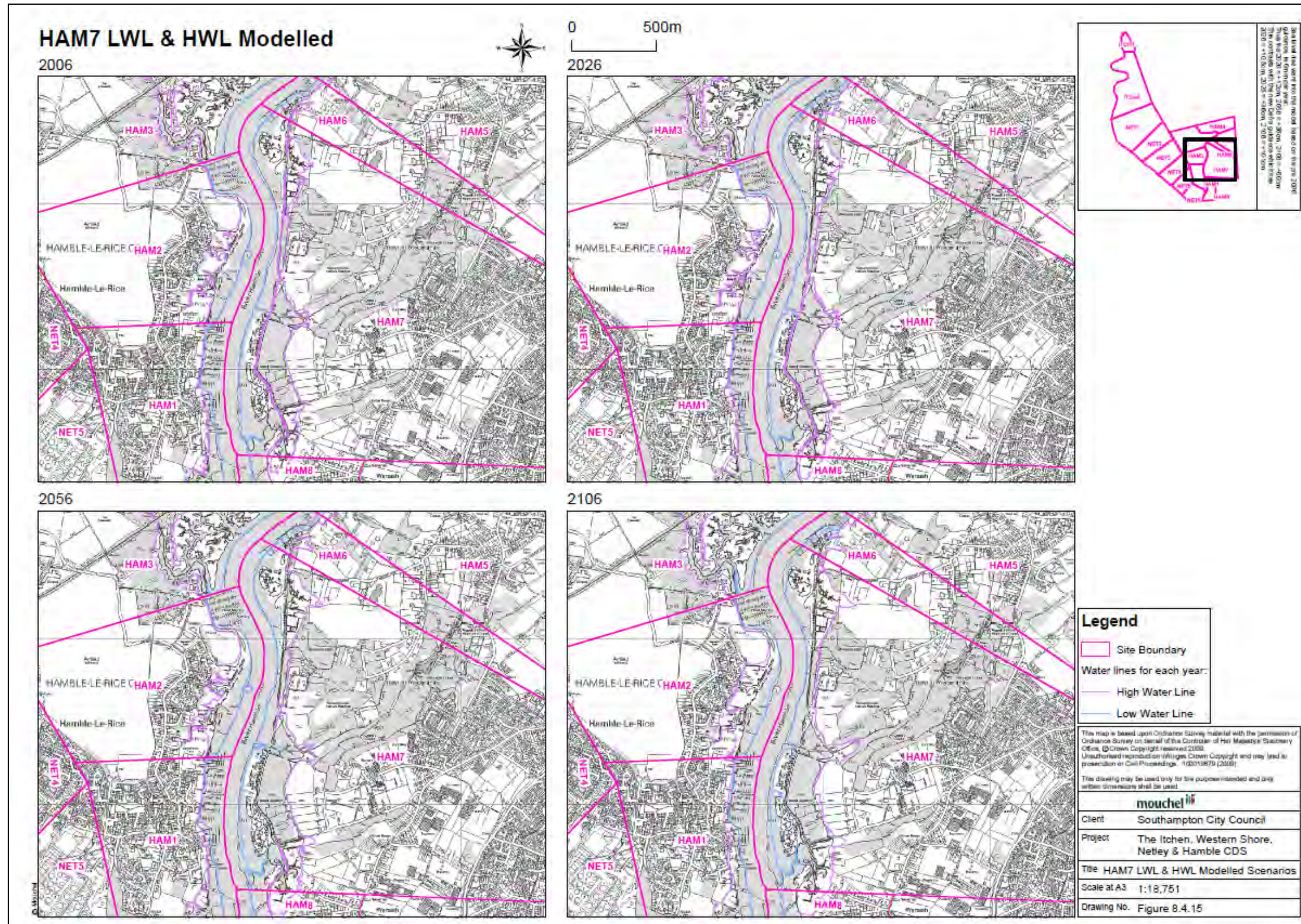


Figure 35: HAM7 modelled flood scenarios



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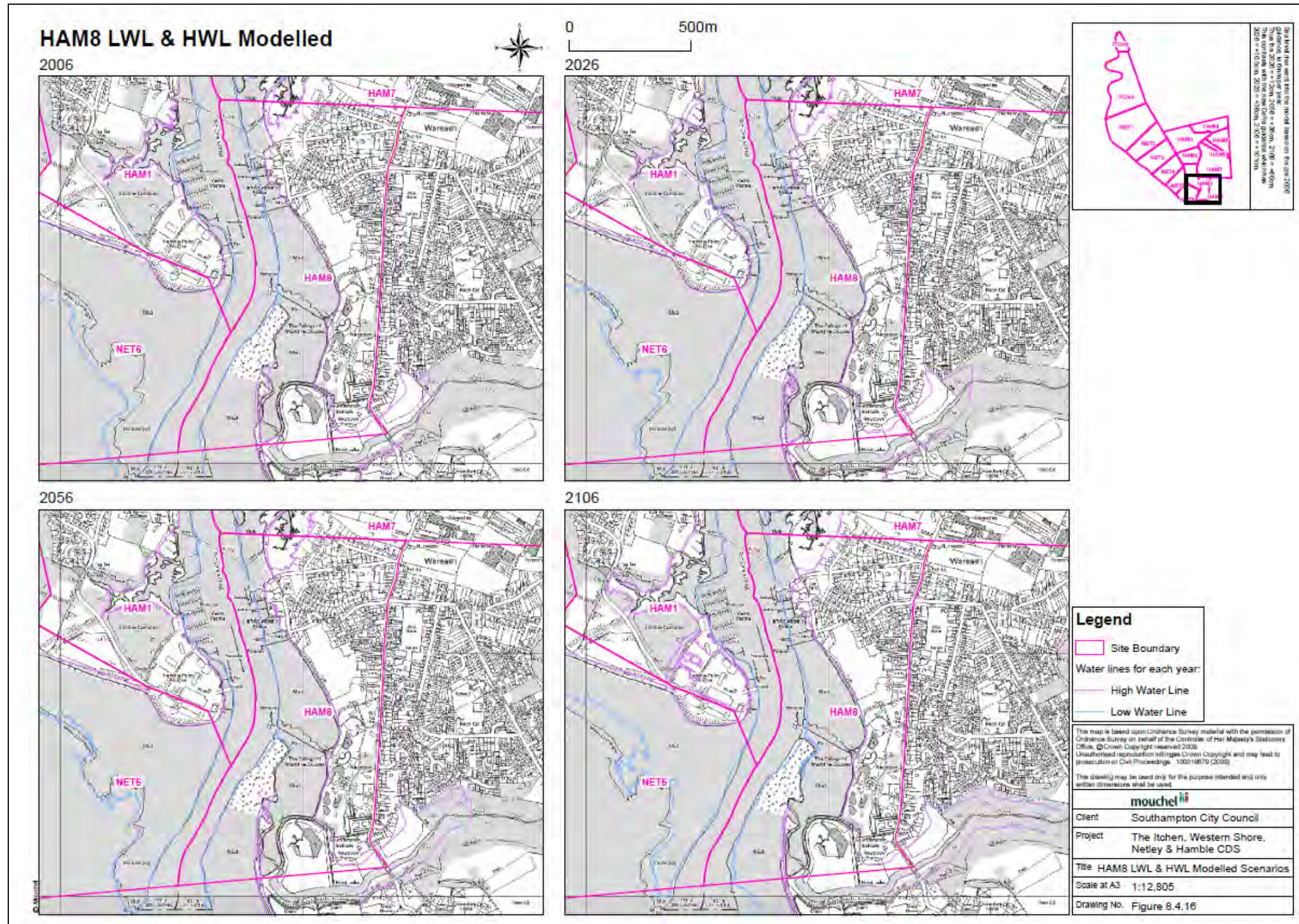


Figure 36: HAM8 modelled flood scenarios



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8.3 Standard of Protection

In considering risk, an assessment is made of the standard of the defences that already exist. In other words, the current standard of protection offered in a particular location.

Coastal defences are typically designed and constructed to protect people and property from a given magnitude of flood or erosion event. This is referred to as the design standard. The standard of protection may decrease over time depending on the condition of the structure, which can be affected by its age, damage and by factors such as sea level rise which reduce the defence's effective height relative to the sea surface.

The National Flood and Coastal Defence Database (NFCDD) developed by the Environment Agency contains information on a variety of natural and man-made defences. Standard of protection information is available for many of the man-made structures within the database. This data has been used in the study, and supplemented by a condition assessment survey carried out specifically to support this study, to determine the existing standard of protection offered at various locations within the study area.

8.4 Defra Outcome Measures

Policy Option selection has also been informed by the use of Defra Outcome Measures (OM). Five OMs are used to calculate and prioritise capital expenditure for projects that will lead to a step change in the standard of protection offered by a defence i.e. improving coastal protection.

Four Defra Outcome Measures:

- Economic Benefits
- Households at Risk
- Households in Deprived Areas
- Nationally Important Wildlife sites
- Biodiversity Action Plan (BAP) Habitat

Once a preferred policy option has been recommended, scheme options can then be developed in more detail, if appropriate. OM scores have not been included in this report as it is expected that individual schemes resulting from this study would provide the scoring required to progress future projects.



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9 Policy Options Assessment

For each Policy Unit a number of potential policy options have been explored. These have each been assessed for their suitability through an analysis of the technical feasibility of implementing that policy, the benefits that would arise from implementing the policy or the damages that would be avoided by implementing the policy, and the environmental acceptability of implementing that policy. This section shows the consideration of potential policy options for each of the Policy Units within the CDS study area. Discussions are tabulated for ease of reference.



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9.1 ITCH3 - Woodmill Lane Bridge to Cobden Bridge

Policy Unit Details		ITCH 3	
Policy Unit start	Woodmill Lane Bridge	Policy Unit End	Cobden Bridge
Grid Ref (start)	44399E, 115322N	Grid Ref (end)	443669E, 114571N
Brief Policy Unit Description			
<p>Frontage adjacent to Riverside Park on the eastern bank of the River Itchen. Low lying (<3mOD) open recreational area behind the frontage which rises gradually to Manor Farm Road (>4mOD). Northern part of the Policy Unit is now undefended with remnants of decaying timber breastworks showing previous defence works. The local area and foreshore is designated as a Local Nature Reserve. The southern part of the Policy Unit, south of the cricket grounds, is defended from erosion by a sloped masonry revetment with either a timber or sheet pile toe and fronts properties in River View Road which runs perpendicular to the frontage. These defences do not serve any flood defence function and flood protection is provided by the rise in ground elevations.</p>			
Defence Description			
Defence Status	Defended (part)	Defence Length	780m of 1585m
Defence type	Masonry revetment or Undefended	Standard of protection	1 in 5
Residual Life	0 - 20 years	Land Use	Open parkland
Overall Asset Condition Score	2	Flood map	Figure 21
Risk of Flooding			
<p>The weir at the northern end of the Policy Unit creates an artificial tidal limit and increases the probability of flooding in the area by preventing the rise of water levels up the river channel on an incoming tide. At the very northern limit of the Policy Unit, Woodmill Lane is shown as being within the modelled flood area. Large areas of Riverside Park and the land immediately behind the defence line are shown as being at risk of flooding. At the southern boundary of Riverside Park, parts of the school grounds are at risk of flooding, although no school buildings are shown as being at risk. A number of properties (estimated 5 or 6 properties) at the western end of River View Road are also shown as being at risk. South of River View Road, the park adjacent to Manor Farm Road, providing open recreational space and including a model railway, is shown as being at risk of flooding. The gardens of a number of properties in Manor Farm Road (estimated 7 gardens) are shown as being at risk of flooding.</p>			
Risk of Erosion			
<p>There is some minor erosion of the northern part of the Policy Unit. The most likely cause of this erosion is river flows and the wash from local boat traffic as wave fetch is minimal. The rate of erosion is minimal as indicated by existing line of dilapidated defences which are surrounded by fine silt sediments, characteristic of low energy environments.</p>			
SMP Policy (1998)			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
<p><i>Continued on next page.</i></p>			

Policy Unit Details		ITCH 3	
Policy Unit start	Woodmill Lane Bridge	Policy Unit End	Cobden Bridge
Grid Ref (start)	44399E, 115322N	Grid Ref (end)	443669E, 114571N
Policy Options Consideration			
<p>Option 1 – No Active Intervention</p> <p><i>Engineering:</i> The entire Policy Unit is undefended against flooding so this option will have no impact on flood risk. The northern part of the Policy Unit is also effectively undefended against erosion as the existing defences are in a very poor condition. At the southern end of the Policy Unit, the erosion defences have a residual life of approximately 20 years. Ceasing maintenance of these defences would have no impact on erosion risk for the first 20 years.</p> <p><i>Economics:</i> The area at risk of flooding is mainly recreational land with limited assets at the southern end of the Policy Unit as the flood extent is limited by rising land levels moving away from the water's edge. Assets at risk of future erosion include two schools and a number of residential properties, though these will not be affected by erosion in the short to medium term following the demise of the erosion protection. As defences fail it may be necessary to remove sections of the defence structures to ensure the safety of public accessing the site. This option has the lowest capital and maintenance costs.</p> <p><i>Environmental Considerations:</i> The area at risk of flooding is of limited environmental value. There are no designated sites or features. The overall river system would benefit from natural erosion and inundation being allowed to take place.</p> <p>Option 2 – Active Intervention</p> <p><i>Engineering:</i> The existing masonry wall at the Southern end of the Policy Unit will require periodic patching and repair to ensure continuation of the erosion defence. In the long term, the defence may need to be raised to provide flood protection as a result of increases in mean sea level. At the northern end of the Policy Unit, an Active Intervention policy could include the construction of new erosion defences, in the form of an embankment (e.g. sloping masonry wall to link up with existing defences at the southern end of the Policy Unit) or a steel sheet pile wall to limit the encroachment of new defences on the width of the river. This could also serve to protect the parkland from flooding as a result on increases in water levels.</p> <p><i>Economics:</i> Any proposals for new defences are unlikely to attract public funding due to the lack of benefits associated with their construction. Whilst new defences would enable protection of the existing parkland and sports fields the capital investment required to construct new defences would be very high, far exceeding the value of the assets protected. Costs to maintain the existing defences would be low making a maintenance option more likely to be viable than a sustain or improve option; however in order to continue the current standard of protection, it may be necessary to increase the height of existing defences in the longer term.</p> <p><i>Environmental:</i> There are no environmental benefits to be gained from protecting the area with erosion or flood defences.</p> <p>Option 3 – Managed Realignment</p> <p><i>Engineering:</i> Existing defences could be allowed to fail, or removed, whilst protection against erosion and long-term increases in flood risk due to sea level rise, could be provided through the construction of new set-back defences at the predicted future Mean High Water line towards the rear of the recreation area. These defences could take the form of a raised earth embankment fronting existing properties in the area. This would allow natural erosion processes to continue in the northern part of the frontage, and erosion could commence in the southern part of the frontage once existing defences have failed, or have been removed, providing a new local sediment supply to the system.</p> <p><i>Economic:</i> A managed realignment scheme could offer increased protection to a number of properties at the southern end of the Policy Unit, including two schools. The area left at risk of future flooding will be limited to mainly recreational land. The likely costs for a set back defence (e.g. approximately £800,000 assuming £1000/metre for a new earth embankment) maybe justified by the protection offered.</p> <p><i>Environmental:</i> The overall river system would benefit from natural erosion and inundation being allowed to take place.</p>			
Policy Option Discussion			
<p>Undefended areas: The northern end of the Policy Unit is effectively undefended however the erosion rate is very low here and the land away from the river rises, limiting the extent of flood inundation. As such, the construction of new defences along the current line or of new set-back defences in this location is not likely to attract funding in the short to medium term. For this reason, a No Active Intervention policy for this undefended section is most likely to be the recommended option for this section of the Policy Unit following economic appraisal. Monitoring of erosion rates and tidal inundation should be carried out to assess whether set back defences should be constructed in the longer term to protect assets that may be at risk of flooding in the longer term.</p> <p>Defended areas: At the southern end of the Policy Unit, the existing stone revetments are in a good condition and currently provide adequate erosion protection. They do not currently serve a flood protection function as they are backed by rising ground behind. Maintenance of the existing defences in the short-medium term would be a cost-effective solution to reducing the erosion risk. This should be coupled with monitoring of the asset condition, particularly at its northern end where it adjoins the undefended frontage, as it may be subject to outflanking, to ensure that more rapid deterioration of the defence is not experienced. In the longer-term these defences may need to be raised or rebuilt if they are required to provide flood protection or the construction of new defences along a set-back line may be justified to reduce the risk of flooding to existing built assets.</p> <p>The following options are to be taken forward to economic appraisal stage:</p> <p>Option 1: No Active Intervention</p> <p>Option 2: Active Intervention</p> <p>Option 3: Managed Realignment</p>			

9.2 ITCH 4 - Cobden Bridge to Weston Point

Policy Unit Details		ITCH 4	
Policy Unit start	Cobden Bridge	Policy Unit End	Weston Point
Grid Ref (start)	443669E, 114571N	Grid Ref (end)	443493E, 110164N
Brief Policy Unit Description			
The entire Policy Unit is defended by a mixture of defence types in various states of repair. Defence types include concrete and steel sheet piled walls, timber breastwork, slipways and occasional short sections of undefended coastline. The majority of these defences are privately owned and maintained and protect privately owned commercial, industrial and residential property.			
Defence Description			
Defence Status	Defended	Defence Length	4970m of 7991m
Defence type	Steel sheet piled seawall / concrete sea wall / timber breastwork / slipways	Standard of protection	1 in 50
Residual Life	20 - 30 years	Land Use	Industrial, residential, nature reserve
Overall Asset Score	4	Flood map	Figure 22
Risk of Flooding			
Modelling shows that the entire ITCH4 Policy Unit is vulnerable to flooding. The width of the flood zone varies between a few metres in front of rising ground to almost 200m on the inside of the meander loops. There are a considerable number of residential and commercial properties (some constructed relatively recently) within the modelled flood area. The heights and types of defences vary along the frontage with newer steel sheet pile walls protecting new residential development at the northern end of the Policy Unit and ad hoc mixed defences south of this development, parallel to Whitworth Crescent to the Railway Bridge. A number of riverside properties are at risk of flooding along this stretch although the extent of inundation does not reach as far as Whitworth Crescent due to the rapid rise of the land moving away from the river (8mOD at Whitworth Crescent). South of the railway bridge a significant number of properties on the western side of Vespasian Road are within the modelled flood area. Further south, part of the Roman town at Bitterne Manor and some residential properties on Hawkeswood Road are within the modelled flood area. The entire industrial estate on Hawkeswood Road is within the modelled flood area. South of Northam Bridge, a number of modern residential developments are at risk of flooding with parts of Quayside Road Industrial Park and adjacent properties within the modelled flood area. Further south, the railway runs along the shoreline with the embankment forming a secondary defence to inundation. As the railway moves away from the shore edge, industrial units and boat yards are commonplace within the modelled flood area. Other significant assets at risk include the Sewage Treatment Works on Victoria Road which is in the modelled flood area. The old Vosper Thorneycroft Ship Yard site opposite Princess Alexandra Docks is currently being developed by SEEDA so it is expected that the defences along this frontage will be upgraded as part of this development.			
Risk of Erosion			
There is little evidence of bank erosion along most of the Policy Unit due to the fact that much of the frontage is currently protected. The causes of any erosion are river flows or the wakes from local boat traffic as the river is too narrow and sinuous to allow for any significant wind wave generation. However, along the extreme southern end of the Policy Unit waves generated across Southampton Water can penetrate the river and contribute to any potential erosion.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<i>Engineering:</i> The entire Policy Unit is heavily defended against flooding and erosion. As defences fail over time, there would be an increase in both erosion and flood risk to properties behind the current defences. As defences fail it would be necessary to remove sections of the defence structures to ensure the safety of the public.			
<i>Economics:</i> The area at risk of flooding and coastal erosion is mainly private commercial, residential and industrial property. Erosion and flooding following the failure of the defences would lead to significant losses. Removal of sections of the defence structures for Health & Safety reasons would have an associated cost. It should also be noted that this policy option would result in the loss of a privately owned section of defence protecting the railway. This option has the lowest capital and maintenance costs.			
<i>Environmental:</i> The overall river system would benefit from natural erosion and inundation being allowed to take place. No environmentally sensitive or designated areas would be lost.			
Option 2 – Active Intervention (Maintain)			
<i>Engineering:</i> Under this Policy Option, existing defences could continue to be maintained by private owners. The land behind the defences along the frontage is generally of a similar level and as such, the level of protection for all property along the frontage is only as good as the lowest defence level. To			

Policy Unit Details

ITCH 4

provide a consistent level of flood protection along the Policy Unit, crest levels would need to be raised to a common standard in the medium-longer term. New defences would most likely comprise of steel sheet pile walls, concrete panel walls or rock revetment. In many cases defences would need to be raised over time to sustain the current level of flood protection in line with sea level rise.

Economics: A significant number of residential and commercial properties would be protected by the ongoing maintenance or improvement of the existing defences. The costs of any scheme to increase the standard of protection along this frontage are likely to be high when compared to the value of property protected.

Environmental: There is natural coastal squeeze here though the defences in this section are not protecting any environmentally sensitive or designated sites so this is not a major issue. Maintenance of the existing defences is unlikely to have any positive or negative effects on the local or wider environment. Increasing the height of any defences would increase the extent of coastal squeeze over time.

Option 4 – Managed Realignment

Engineering: Such is the close proximity of the private commercial, residential and industrial properties to the frontage that any retreat of the existing line of defence would result in significant losses of residential and commercial property.

Economics: Any cost of works to retreat the line of flood and coastal erosion defence along this Policy Unit would be coupled with the cost of losses to the private commercial, residential and industrial properties as well as an important railway link. This is not a financially viable option.

Environmental: The overall river system would benefit from a managed retreat situation where some natural erosion and inundation would be allowed to take place. No environmentally sensitive or designated areas would be lost and there would be potential habitat gains from this Policy Option.

Option Discussion

This Policy Unit is already heavily defended against both erosion and flooding. While all existing defences provide a similar level of erosion protection, the level of flood protection depends on defence crest height which is highly variable, ranging from <2.5mOD to >5mOD. The majority of the defences along the Policy Unit are privately owned and protect private commercial, residential and industrial property. The only significant section of publicly owned defences is at Bitterne Manor, owned by Southampton City Council, which lies immediately north of a section of rail defences. As such, it is likely that any ongoing maintenance or replacement of defences would have to be carried out by private landowners as there is unlikely to be sufficient benefit: cost to support publicly-funded defence.

A managed realignment policy is not feasible. Any option to sustain or improve the existing defences is unlikely to achieve a reasonable benefit: cost ratio to attract funding. Ongoing maintenance of existing defences, coupled with monitoring of their condition is likely to be the most suitable option, until defences are no longer cost effective to maintain. At this stage sections of defence could be removed, upgraded or replaced..

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

9.3 NET 1 – Weston Point to Netley Castle

Policy Unit Details		NET 1	
Policy Unit start	Weston Point	Policy Unit End	Netley Castle
Grid Ref (start)	443493E, 110164N	Grid Ref (end)	445023E, 108900N
Brief Policy Unit Description			
The immediate hinterland comprises open recreational land formed from previous land reclamation, created by the infilling of former coastal marshland area.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	550m of 2078m
Defence type	Concrete filled bags, masonry wall	Standard of protection	1 in 10
Residual Life	10-20 years	Land Use	Recreational land
Overall Asset Score	5	Flood map	Figure 23
Risk of Flooding			
Based on the modelled flood map, the western end of the Policy Unit is low-lying and some residential property between Victoria Road and Hulton Close is within modelled flood area. However, recent LIDAR data and field observations show that this area has an elevation of >4mOD. Further east along the Policy Unit, the ground rises and the extent of inundation is limited to the recreational land between the sea and Weston Parade. At the very eastern end, high ground reaches the water line with flood risk restricted to the grounds around Netley Castle.			
Risk of Erosion			
The erosion of the frontage has exposed the made ground used to reclaim the recreational ground at Weston. The access road that was constructed along the coastline to infill the coastal marshes has been exposed at Weston Point. Once erosion proceeds beyond this road it is feared that the bulk of the infill material will become directly exposed to the sea and might have to be removed for Health & Safety, pollution and environmental reasons.			
Existing SMP Policy			
Hold the Existing Defence Line or Retreat the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> Without erosion protection the man made ground at Weston will continue to erode. This will further expose the landfill material which may prove a Health & Safety or environmental risk requiring the excavation and removal of the material at significant cost. As much of this land is low lying, this policy would also increase the risk of flooding in the area and may place properties at risk. The Weston frontage is important from a recreational point of view, providing the main recreational beach in the area. This is likely to be lost under this policy,</p> <p><i>Economics:</i> This option would lead to an initial loss of beach, followed by loss of coastal access roads, recreational paths and park areas. Residential properties in the Woolston and Weston area would be increasingly exposed to a higher risk of flooding. Exposed landfill material may prove to give environmental or health and safety risks requiring clean up costs.</p> <p><i>Environmental:</i> It would be expected that the overall estuary environment would benefit from the natural erosion. Increased erosion or flooding would not have any affect on any national or international designated sites. The unknown content of the former landfill may have potential for significant environmental harm.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> The existing erosion line is already landward of the former defence line provided by the now failed coastal defences at this location. New defences could be constructed along this existing erosion line to prevent further erosion and further loss of the infill material at Weston. There would be no significant change to the immediate area if the defences were set along the current erosion line, however the use of hard defences could cause increased erosion and outflanking at either end of the defended area. The use of soft defences, such as beach recharge, along this line would be preferable as this would reduce the risk of outflanking. Alternatively, new defences could be constructed seaward of the existing erosion line, along the former defence line. This work would require infill to the area between the new defence line and the current erosion line to effectively extend the recreational area behind.</p> <p><i>Economics:</i> A number of residential and industrial properties, including the access road at Weston Point, would be protected by maintenance of the existing defences, or improvement of defences along this frontage.</p> <p><i>Environmental:</i> The land to the rear of the existing defence line is not environmentally sensitive or statutory designated. However the seaward area, the intertidal zone, has designations that could be affected by any defence works carried out.</p>			

Policy Unit Details

NET 1

Option 3 – Managed Realignment

Engineering: A new line of defence could be constructed landward of the existing erosion line allowing more natural erosion to occur. This option would provide the opportunity to reinstate the coastal marshland that existed prior to the infilling works. This would however lead to a loss of the coastal paths and the recreation area would be decreased in size. A retreat of the defence line would require removal of the landfill materials, the content of which is currently unknown.

Economics: The loss of coastal access and recreational area could result in a decrease in visitor numbers affecting the local economy. Any cost of works to retreat the line of defence along this frontage would be coupled with the partial loss of coastal access, therefore, it is not expected to be financially viable to retreat the line of the defences beyond the current erosion line.

Environmental: The overall river system would benefit from a managed realignment where some natural erosion and inundation would be allowed to take place. No environmentally sensitive or designated areas would be lost but there could be some habitat gain from this policy option.

Policy Option Discussion

The SMP policy (1998) of Hold the Existing Line has not been implemented and the current erosion line has already retreated in the absence of intervention behind the previous line of defence.

The erosion of the frontage has exposed the made ground used to reclaim the recreational ground at Weston. The access road that was constructed along the coastline to infill the coastal marshes has been exposed at Weston Point. Once erosion proceeds beyond this road, landfill material will become directly exposed to the sea. The infill material exposed to date appears to be inert but no investigations of its content have been carried out.

As the immediate hinterland comprises open recreational land there is an opportunity to set back the defences and to allow erosion to occur. However as much of the land is low lying this may increase the risk of flooding which may place additional property at risk. Also the Weston frontage is important from a recreational point of view with the main recreational beach along the frontage.

New defences could be constructed along the existing erosion line or seaward of this line to prevent further erosion and to reduce flood risk. Any hard defences are likely to become outflanked at either end of the Policy Unit and as such a preferred engineering structure would be of a soft construction. A suitable solution could include beach recharge using locally sourced materials to improve the existing beach, whilst offering protection to the road from erosion, and preventing further exposure of the landfill material. Care should be taken not to have an impact on the important intertidal area.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

Option 3: Managed Realignment

9.4 NET2 – Netley Castle to Netley Hard

Policy Unit Details		NET 2	
Policy Unit start	Netley Castle	Policy Unit End	Netley Hard
Grid Ref (start)	445023E, 108900N	Grid Ref (end)	445712E, 108033N
Brief Policy Unit Description			
<p>The Policy Unit largely comprises the Netley Cliffs. A number of large apartment buildings have been constructed along this frontage. Properties are generally 25 - 30m back from the soft cliffs that provide protection from erosion and flooding. The cliffs which front of the built up area of Netley are mostly undefended or defended by ad hoc defences which have been constructed by the private property owners along the frontage. All defences along the frontage are privately owned including the wall adjacent to Abbey Hall and Netley Hard, which is owned by Hound Parish Council.</p>			
Defence Description			
Defence Status	Defended (Part)	Defence Length	695m of 1094m
Defence type	Natural soft cliffs / part defended with sheet pile or masonry sea wall	Standard of protection	1 in 10
Residual Life	10-15 years	Land Use	Residential
Overall Asset Score	5	Flood map	Figure 24
Risk of Flooding			
<p>The modelled flood maps show the NET2 Policy Unit as being vulnerable to flooding at its eastern end. The three most Easterly apartment buildings (Netley Cliff) and the eastern end of Victoria Road, where it fronts Spear Pond Gulley, are shown as vulnerable to flooding.</p>			
Risk of Erosion			
<p>As the Policy Unit largely comprises the Netley Cliffs the land is predominantly at risk from erosion.</p>			
Existing SMP Policy			
Hold the Existing Defence			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> The undefended cliffs will continue to retreat and the seawall fronting the recreation ground east of Netley Castle will deteriorate and finally collapse. The erosion of the cliff will contribute sediment to the frontage. As the defences are dominated by masonry walls and gabions, their deterioration is likely to pose H&S risks requiring intervention. The erosion protection defences fronting the higher ground at the eastern end will deteriorate with time leading to a resumption of cliff erosion. With the closest distance between properties and the cliff edge being approximately 15m it would take around 30 years for the erosion to reach the properties after the demise of the defences.</p> <p><i>Economics:</i> There is a potential for a number of private properties to be lost, together with access routes, if a No Active Intervention policy is implemented. There would also be increased pressure on adjacent defences to both sides of NET2 that would increase maintenance costs for protecting these areas.</p> <p><i>Environmental:</i> The erosion of the cliffs will provide material to the frontage. It will extend the width of Southampton Water and thus provides accommodation space for flood waters. Longshore transport will be uninterrupted.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> A single scheme would be adopted to provide coastal protection along this frontage. It should be noted that the types of defence along the frontage are various and they are in very differing states of repair. The local authority does not own any current assets. Sections of the frontage that are presently undefended would continue with no intervention, except at private landowners cost. A study for Eastleigh Borough Council, carried out by Mouchel in 2008 (see Appendix L) that outlines potential schemes and their benefit: cost implications found that a beach recharge scheme would be a preferred option for NET2. The main material required for implementation of this scheme is a supply of suitably graded shingle. The report mentions that Eastleigh Borough Council may be able to obtain material arising from ABP's proposed dredging programme for Southampton Water, due to commence in 2010. As such the cost of shingle would be low. The material would need to be of a suitable grading. A review of core logs provided by ABP shows a wide range of shingle sizes within the samples. It should therefore be relatively easy to source suitable graded material. There may be some fees associated with the grading and selection of suitable sized sediments by ABP as this is not a cost associated with their usual disposal practises. It has been estimated that approximately 79,315 cubic metres of material is required.</p> <p><i>Economics:</i> The costs associated with a beach recharge scheme would be relatively low compared to any other active intervention. For the purposes of preferred policy options selection, the economic appraisal should assume costs of required materials are available at current commercial prices.</p> <p><i>Environmental:</i> It is likely that defending presently undefended parts of the cliff would reduce the amount of sediment entering the system. It would be</p>			

Policy Unit Details

NET 2

impossible for Southampton Water to widen so that with sea level rise the intertidal area would decrease in size. The beach is likely to narrow and disappear with time. A beach recharge scheme would provide a natural defence and by correct profiling could provide additional intertidal habitats. The added beach material would also be moved through longshore transport, creating further more natural coastal defence to other frontages.

Option 3 – Managed Realignment

Engineering: Retreating the line of defences would result in removing current defences and setting them back resulting in loss of property along this frontage including a school. Holding the line where there are current defences and retreating areas that do not require immediate defence would be a viable engineering solution.

Economics: Removing current defences and setting the line back with new defences would require a high capital cost with ongoing maintenance costs and therefore would not be expected to be an economically viable solution.

Environmental: Retreating the line would temporarily create intertidal habitat, but would be lost within 100 years due to coastal squeeze.

Policy Options Discussion

No Active intervention and Managed Realignment policies have significant economic and social implications with regard to the properties that require protection along this frontage. Active Intervention to Maintain or Improve the existing defences through repairs to existing defences or a beach recharge scheme could be preferred policy options due to the protection required for property on this frontage.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

9.5 NET3 – Netley Hard to Cliff House

Policy Unit Details		NET 3	
Policy Unit start	Netley Hard	Policy Unit End	Cliff House
Grid Ref (start)	445712E, 108033N	Grid Ref (end)	446545E, 107277N
Brief Policy Unit Description			
Most of the Policy Unit is backed by the Royal Victoria Country Park (RVCP). Ground elevations decrease from >5mOD in the northwest to <4mOD in the southeast at the Netley Sailing Club. There is no beach, even at low tide, for most of the RVCP frontage but beach width increases towards the east forming a storm ridge at the eastern end. The low (~3.5mOD) seawall along the eastern part of the RVCP only provides erosion protection to the ground that rises from the seawall landwards.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	990m of 1123m
Defence type	Natural soft cliff fronted by steel sheet pile or concrete sea wall	Standard of protection	1 in 10
Residual Life	10 – 20 years	Land Use	Recreational / part-residential
Overall Asset Score	5	Flood map	Figure 25
Risk of Flooding			
The modelled flood area maps show the NET3 Policy Unit has little risk from flooding apart from the frontage associated with a small stream immediately adjacent to the RSCP Yacht Club slip. This stream is channelled through the foreshore in a piped outfall.			
Risk of Erosion			
As much of the Policy Unit comprises low cliffs the land is primarily at risk from erosion.			
Existing SMP Policy			
Retreat the Existing Defence Line or Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> The existing defences fronting the Royal Victoria Country Park are failing. In the case of the defences along the western part of the Policy Unit, these contain a substantial amount of concrete supporting the footpath at the top which is likely to require the removal of some of the failing structures.</p> <p><i>Economics:</i> There are a number of assets at risk from flooding and coastal erosion on this Policy Unit however the losses would not be significant in terms of economic loss. The main concern in this Policy Unit is the loss of the access to RVCP which provides a significant contribution to the local economy through visitor parking fees.</p> <p><i>Environmental:</i> The demise of the coast defence structures will restart the erosion of the low cliffs. Cliff recession is likely to be greatest at the western end of the Policy Unit, where levels in front of the seawall are at ~-1mOD. Resumed erosion will provide sediment to the frontage and its neighbours.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> The types of defence along the frontage are various and they are in very differing states of repair. A single scheme could be adopted to maintain all existing local authority owned defence assets along the frontage length to bring them up to their design standard. Under rising sea-levels, wave reflection from the seawall will increase, even further disrupting any longshore shore transport along the frontage and requiring additional measures to stabilise the section. The low seawall towards the east may need to be raised to provide not only erosion but also flood protection. To provide flood protection, a seawall may need to be built at the eastern end to protect the area from an increasing risk of flooding. Sections of the frontage that are presently undefended by the local authority or defended privately could continue with no intervention, except at the expense of private landowners. Another option could be to place graded shingle beach material in front of the existing steel sheet pile wall to provide protection to the structure from wave action and eroding currents, together with repairs to specific parts of the seawall where they present a public safety hazard, through infilling core material and patching of the steel sheets as needed. The main material required for implementation of this scheme is a supply of suitably graded shingle. In a report by Mouchel 2008 entitled 'Royal Victoria Park, Netley and Netley frontage - Outline Schemes and benefit: cost implications study' (see Appendix L) it was estimated that approximately 96,065 cubic metres of material is required.</p> <p><i>Economics:</i> A Maintain policy would involve the patch repair of the existing sheet pile and masonry sea wall with additional seawall required, and this could be costly from a whole life perspective. For a beach recharge scheme, initial and ongoing long term maintenance costs would be required. Suitable material may be available from ABP's proposed dredging programme for Southampton Water, due to commence in 2010. For the purposes of any economic appraisal, the current commercial value of this material must be used.</p> <p><i>Environmental:</i> Any option to keep the existing defence line along the defended frontage will suppress any natural input of material into the coastal zone. Maintaining</p>			

Policy Unit Details

NET 3

the existing defence line at the eastern end of this Policy Unit will prevent the beach from rolling back under sea level rise and assuming the installation of the flood defence wall will lead eventually to the disappearance of the present beach.

Option 3 – Managed Realignment

Engineering: The western half of the existing defences in front of the Royal Victoria Country Park are in a poor condition and access along this frontage has been closed off while remedial work to improve public safety is undertaken. As RVCP is the main concern of Hampshire County Council it is important that options be discussed with Hampshire CC in the context of the work they have already undertaken.

Economics: As these defences front a 3 to 4m high cliff fronting the Country Park it is unlikely that a complete removal and installation of new defences can be warranted on economic grounds.

Environmental: Removal of the existing defence and installing new defences at a set back line would result in loss of the RVCP area. A new access road would also be required for the park using more recreation area. Managed realignment would mitigate coastal squeeze brought about by defences on the current line coupled with future sea level rise.

Policy Options Discussion

RCVP provides an important function in terms of recreational value for local residents, as well as bringing in visitors and associated income to the area. It is likely that its economic and social benefits would be sufficient to justify an Active Intervention Policy for this Policy Unit. Previous studies indicate that the benefit: cost ratio of an active intervention policy option may be significant.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

9.6 NET4 – Cliff House to Ensign Industrial Park

Policy Unit Details		NET 4	
Policy Unit start	Cliff House	Policy Unit End	Ensign Industrial Park
Grid Ref (start)	446545E, 107277N	Grid Ref (end)	447218E, 106544N
Brief Policy Unit Description			
The Policy Unit is characterised by the transition from the high ground of the Hamble Cliffs (~10mOD) to the low lying area of Hamble Common and surroundings (<4mOD). The Policy Unit is undefended with protection afforded by the Hamble Cliffs and the beach in front of them, which extends southwards changing into a vegetated shingle bank.			
Defence Description			
Defence Status	Undefended	Defence Length	0m of 998m
Defence type	N/A	Standard of protection	N/A
Residual Life	N/A	Land Use	Residential and industrial
Overall Asset Score	N/A	Flood map	Figure 26
Risk of Flooding			
The modelled flood map shows the NET4 Policy Unit has little risk from flooding apart from the area of low lying grass land at the eastern end of the frontage immediately adjacent to Mitchell Point.			
Risk of Erosion			
As much of the Policy Unit comprises low cliffs the land is primarily at risk from erosion.			
Existing SMP Policy			
Retreat the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> No are no defence structures along this Policy Unit. Land levels are generally high and there is no flood risk to the area. The Geomorphological survey also suggests that there is no net erosion in this area.</p> <p><i>Economics:</i> It is unlikely that there would be any loss of property as a consequence of flooding or coastal erosion within 100 years.</p> <p><i>Environmental:</i> There is presently little evidence for erosion of the Hamble Cliffs. The cliffs are comprised of sandy gravel which could provide a natural input of material very similar to the present beach if erosion rates were to increase over time.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> Defences could be constructed at the western end of the frontage to prevent future erosion of the cliffs. New defences at the eastern end could protect from flooding and natural retreat due to erosion of the eastern part of the coastline. The total length of defence required would be 998m of 1.5m high defences. Advancing the line on this frontage would involve setting a permanent structure such as a seawall or sheet piles approximately 2m from the existing vegetation line. This could lead to outflanking at either end of the new defence line which would have impacts on the two adjacent Policy Units.</p> <p><i>Economics:</i> The costs of constructing new defences along this undefended coastline would be high and given that there are unlikely to be any benefits realised within the next 100 years, the economic appraisal is unlikely to support this as an option for future management.</p> <p><i>Environmental:</i> Active Intervention by the construction of new coastal defences could contribute to the sediment starvation of the system by removing Hamble Cliffs as a potential future source of beach material. There is no environmental benefit of any Active Intervention policy along this Policy Unit.</p>			
Option 3 – Managed Realignment			
<p><i>Engineering:</i> Both residential and industrial properties are >60m away from the present water line at land elevation of >6mOD. Retreating the line would involve setting a line just behind the existing vegetation line and could involve an earth or shingle bund.</p> <p><i>Economics:</i> The costs of constructing new set back defences along this undefended coastline would be high and given that there are unlikely to be any benefits realised within the next 100 years, the economic appraisal is unlikely to support this as an option for future management.</p> <p><i>Environmental:</i> Environmental benefits will be achieved from a Managed Realignment option through the inundation of the low lying grass area and the creation of intertidal habitat. However the same benefits will be realised from a No Active Intervention policy for the frontage.</p>			

Policy Unit Details	NET 4
Policy Option Discussion	
<p>The nearest property is 60m from the current water's edge at an elevation of more than 6mOD. As such flood protection is provided naturally by the rise in land levels away from the current waterline. The Cliff Report cites negligible erosion on this frontage so assets are unlikely to be affect by erosion within the next 100 years. If erosion rates increase over time, the Industrial Works frontage and the Westfield Common Road frontage of Hamble could be threatened. As such, a policy option for No Active Intervention with regular monitoring of the erosion rates along the frontage is likely to be most feasible for this Policy Unit.</p> <p>The following options are to be taken forward to economic appraisal stage:</p> <p>Option 1: No Active Intervention</p> <p>Option 2: Active Intervention</p>	

9.7 NET5 –Ensign Industrial Park and Hamble Oil Terminal

Policy Unit Details		NET 5	
Policy Unit start	Ensign Industrial Park	Policy Unit End	Hamble Oil Terminal
Grid Ref (start)	447218E, 106544N	Grid Ref (end)	447828E, 106043N
Brief Policy Unit Description			
The Policy Unit covers the Mitchell Point Industrial Park and the Hamble Oil Terminal. The seaward part of the frontage is low lying and protected by a raised embankment and steel sheet piled wall, both of which are fronted along most their length by a gravel beach.			
Defence Description			
Defence Status	Defended	Defence Length	590m of 792m
Defence type	Raised embankment / Steel sheet piled wall	Standard of protection	1 in 10
Residual Life	10-20 years	Land Use	Industrial
Overall Asset Score	4	Flood map	Figure 27
Risk of Flooding			
The modelled flood area mapping shows the NET5 Policy Unit as being vulnerable to flooding. The flood mapping shows that a significant proportion of the assets at Mitchell Point and Oil Terminal are at risk from flooding.			
Risk of Erosion			
Negligible erosion.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<i>Engineering:</i> Over time, the existing structures will deteriorate. With a rise in sea level, the risk of overtopping of the defences will increase.			
<i>Economics:</i> Property and assets (particularly the Hamble Oil Terminal) along this Policy Unit have a high financial value; therefore a No Active Intervention Policy will result in high cost damages in the medium to long term. It is also a possibility that by the time the defences at the oil terminal have been overtopped or breached (approximately 50 years) there will be less demand for oil therefore taking away the necessity of the terminal.			
<i>Environmental:</i> Flooding of the oil terminal would have a serious negative impact on the surrounding environment.			
Option 2 – Active Intervention			
<i>Engineering:</i> The existing defences will need to be replaced toward the end of their life span and in the light of sea level rise; they will also need to be raised in the future. Depending on the future development of the foreshore, hard structures may be required in front of the embankment to protect it from erosion.			
<i>Economics:</i> Given the high value of the industrial assets along this Policy Unit the likely strategy would be to maintain and to reconstruct the existing defences as needed.			
<i>Environmental:</i> Holding the line will in the long-term lead to this frontage become aligned seawards of the neighbouring frontages. This will disrupt any longshore transport with negative impact on the neighbouring frontages.			
Option 3 – Managed Realignment			
<i>Engineering:</i> Under this option, defences fronting the oil terminal could continue to be maintained, or even improved to provide continued protection into the long term. Set back defences could be installed to the west of the oil terminal allowing the area of land to flood overtime, whilst not compromising the protection of the oil terminal			

Policy Unit Details	NET 5
<p><i>Economics:</i> The high costs associated with the construction of new set back defences may prevent this from being a viable option.</p> <p><i>Environmental:</i> Retreating the line would allow for the natural alignment of the coastline in response to sea level rise. The set back defence line needs to ensure continued protection of the oil terminal to prevent future issues relating to contaminated land due to the current use of the site.</p>	
Policy Option Discussion	
<p>Future defences may need to be raised and existing defences removed at the end of their lifespan. Depending on future development of the foreshore, hard structures may be required in front of the embankment to protect it from erosion. Retreating the line would involve decommissioning of Terminal Storage Tanks allowing for realignment of the coastline.</p> <p>The following options are to be taken forward to economic appraisal stage:</p> <p>Option 1: No Active Intervention</p> <p>Option 2: Active Intervention</p>	

9.8 NET6 – Hamble Oil Terminal to Hamble Common Point

Policy Unit Details		NET 6	
Policy Unit start	Hamble Oil Terminal	Policy Unit End	Hamble Common Point
Grid Ref (start)	447828E, 106043N	Grid Ref (end)	448689E, 105764N
Brief Policy Unit Description			
The Policy Unit is backed by extensive areas of low lying ground <4mOD decreasing to <3mOD on the eastern side of Hamble Common, almost forming a connection through a channel with an elevation of <2m between Southampton Water and the River Hamble. The eastern end is occupied by Hamble Point Marina which was built in the mid 1990s.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	420m of 876m
Defence type	Limestone rock revetment / none	Standard of protection	1 in 20
Residual Life	10– 20 years	Land Use	Grassland, Marina
Overall Asset Score	2	Flood map	Figure 28
Risk of Flooding			
The modelled flood area mapping shows the NET6 Policy Unit as being very vulnerable to flooding. Much of Hamble Common and the whole of the Hamble Point Marina are vulnerable to flooding.			
Risk of Erosion			
The Policy Unit is also experiencing significant erosion as is shown by the erosion scarp that exists along much of the frontage.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> Both the erosion defences at the Oil terminal and the Marina will last for the next 20 years and will hold the line in these places. After 20 years the defences would decay and breakdown completely and offer no protection to the assets. A programme for removal the remains of the defences would be required to ensure there is no threat to public safety.</p> <p><i>Economics:</i> The increase in the frequency of flooding will disrupt access to Hamble Point Marina, though this is more likely to happen in winter when the Marina is likely to be less busy. The eventual connection between Southampton Water and the River Hamble will sever the access to the Marina unless the road is raised or a bridge constructed. The breakdown of the defences up to and after 20 years would require works to remove some of the remains for public safety at a cost of £20,000 per year. This cost would include an inspection programme.</p> <p><i>Environmental:</i> The low cliff along Hamble common will continue to retreat with the retreat potentially accelerating with a rise in sea level. This sea level rise will also lead to an increase in frequency of flooding of Hamble Common and towards the end of the 100 year horizon there is a good chance for a connection forming between Southampton Water and the River Hamble.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> To maintain the existing line, coastal erosion and flood defences would have to be built along the Hamble Common frontage to prevent the retreat of the low cliff and to protect the area from flooding. Flood prevention needs to take into account the policy for the HAM1 Policy Unit to prevent flooding from the north.</p> <p><i>Economics:</i> The benefits afforded by any potential scheme on this frontage are unlikely to be sufficient to secure public funds. As such, in order for the marina to remain operational, it is likely that the marina operators would have to fund any future defences of their own assets.</p> <p><i>Environmental:</i> This option would not allow the natural development of the estuary.</p>			

Policy Unit Details

NET 6

Option 3 – Managed Realignment

Engineering: This option would enable the natural evolution of the coast around Hamble Common but would require the access road (and any services) to Hamble Marina to be rerouted. New defences may be required on a set back line to protect the flanks of the oil terminal.

Economics: The benefits afforded by any potential scheme on this frontage are unlikely to be sufficient to secure public funds. As such, in order for the marina to remain operational, it is likely that the marina operators would have to fund any future set back defences or movement of any infrastructure to protect their own assets.

Environmental: This option would allow the natural development of the estuary with potential benefits to the environment from the natural functioning of the estuary systems.

Policy Option Discussion

Active Intervention policies and Managed Realignment policies will not realise sufficient benefits to secure public funding. In the long term, if natural processes are allowed to occur without intervention, the raised area of Hamble Point Marina may become separated from the mainland, by the ingress of water through the low lying channel which connects with the HAM1 Policy Unit. It is possible that the marina could remain operational through the rerouting of key infrastructure and the construction of either set back defences to protect the access road, or through raising the access road and allowing the movement of water underneath. Such schemes are unlikely to attract public funding.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

9.9 HAM1 – Hamble Common Point to Satchell Marshes

Policy Unit Details		HAM 1	
Policy Unit start	Hamble Common Point	Policy Unit End	Satchell Marshes
Grid Ref (start)	448569E, 105671N	Grid Ref (end)	448489E, 107340N
Brief Policy Unit Description			
This Policy Unit comprises of the Hamble Point Marina in the south and the Port Hamble Marina in the north with further jetties, slipways and pontoons in between fronting Rope Walk and The Quay. Between the two marinas lies an area of saltmarsh that includes the northern part of Hamble Common.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	1220m of 2026m
Defence type	Sea wall (various) / embankment / timber palisade / undefended	Standard of protection	1 in 20
Residual Life	10– 20 years	Land Use	Commercial (Water-based). Some residential.
Overall Asset Score	3	Flood map	Figure 29
Risk of Flooding			
The modelled flood area mapping shows the HAM1 Policy Unit as being vulnerable to flooding. To the south Hamble Common and the Hamble Point Marina are vulnerable to flooding. The Hamble-le-Rice frontage is also vulnerable to flooding and in particular Green Lane, The Quay, Rope Walk and the whole of Port Hamble. The landward extent of the flood zone is limited by the rising ground 40 to 70m landwards of the present waterline. The existing defences only stabilise the bank and as they do not rise above the bank, do not provide additional flood defence to that provided by the land elevation.			
Risk of Erosion			
Because the Policy Unit is backed by a narrow strip of low lying ground <3m the risk of flooding is dominant.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<i>Engineering:</i> Over time, the existing bank protection is likely to fail, allowing bank erosion to commence allowing flooding to commence to the south at Hamble Common and Hamble Point Marina. The Hamble-le-Rice frontage would also be at increased risk of flooding, in particular at Green Lane, The Quay, Rope Walk and the whole of Port Hamble.			
<i>Economics:</i> A significant amount of property is at risk of flooding, including commercial marina activities and some residential property.			
<i>Environmental:</i> Bank erosion together with increased frequency of flooding would start to bisect the strip of low lying ground seawards of Rope Walk Way, potentially forming a high saltmarsh area.			
Option 2 – Active Intervention			
<i>Engineering:</i> Under a maintain scenario, properties are still flooded and no additional benefits would be afforded from this option. To increase the benefits of a scheme, an improve option, including the raising of existing defences would be required. This would need to add protection at the low spots afforded by the two slipways in the area, for example through the installation of flood gates.			
<i>Economics:</i> It is likely that the existing Hamble Point Marina will continue to be defended by private landowners. The defences at Hamble Point comprise rock revetment which has recently been constructed and are in good condition. The Hamble-le- Rice river frontage comprises steel and concrete quay walls which are in good condition and are likely to be maintained. New flood gates would cost in the region of £50K each, but significant improvements would be required to all adjacent defences to ensure a consistent Standard of Protection, at considerable cost.			
<i>Environmental:</i> Ongoing maintenance or improvement of existing defences will not have any significant environmental impact as the presence of existing defences will already lead to coastal squeeze under rising sea levels.			
Option 3 – Managed Realignment			
<i>Engineering:</i> The only suitable location for set back defences is at Hamble Point Marina. The defences would be set back approximately 200 m to allow natural erosion and widening of the estuary mouth to take place.			

Policy Unit Details	HAM 1
<p><i>Economics:</i> A managed realignment option is unlikely to attract public funding and would therefore need to be funded by private landowners. There are no financial benefits of this option for the private landowners and as such it is unlikely to be seen as a viable policy option.</p> <p><i>Environmental:</i> Setting back the defences at Hamble Point Marina would enable natural erosion to occur and result in a widening to the mouth of the estuary.</p>	
Policy Options Discussion	
<p>Port Hamble is privately owned and has defences which are in good condition and which are likely to continue to be maintained by the private operators of the marina. A number of properties are at risk of flooding, however the costs of implementing an effective scheme to protect these properties, which are already at risk of flooding, may prove to be prohibitive.</p> <p>The following options are to be taken forward to economic appraisal stage:</p> <p>Option 1: No Active Intervention</p> <p>Option 2: Active Intervention</p> <p>Option 3: Managed Realignment</p>	

9.10 HAM2 – Satchell Marshes to Badnam Creek

Policy Unit Details		HAM 2	
Policy Unit start	Satchell Marshes	Policy Unit End	Badnam Creek
Grid Ref (start)	448489E, 107340N	Grid Ref (end)	448530E, 108299N
Brief Policy Unit Description			
The Policy Unit is fronted by saltmarsh with some nominal defence at access points. The northern part of the undefended frontage shows some marginally higher ground. Mercury Yacht Marina is fronted by steel sheet pile defences.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	600m of 1333m
Defence type	Steel sheet pile wall	Standard of protection	1 in 10
Residual Life	10 years	Land Use	Marina and residential
Overall Asset Score	4	Flood map	Figure 30
Risk of Flooding			
The modelled flood area mapping shows the HAM2 Policy Unit as being vulnerable to flooding, in particular the undefended frontages of Satchell Marshes, Mercury Gardens and St Agatha's Road as well as the whole of Mercury Marina. Almost all properties are located above 3mOD and are thus at low risk of flooding. The existing defences only stabilise the bank and as they do not rise above the bank, do not provide additional flood defence to that provided by the land elevation.			
Risk of Erosion			
The only risk of erosion relates to the edges of the saltmarsh.			
Existing SMP Policy			
Retreat the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> The bank protection along Mercury Marina will deteriorate over the next 20 years leading to a collapse of part of the Marina frontage to create a more natural slope than the present 5m vertical drop. Following this initial bank erosion, a more natural development in line with the higher ground just south of the Marina can be expected.</p> <p><i>Economics:</i> Losses on this frontage would be minimal assuming Mercury Marina continues to operate at the owners cost.</p> <p><i>Environmental:</i> With rising sea levels, the landward inundation limit of the saltmarsh will move further landward while the existing saltmarsh surface may grow vertically given sufficient sediment supply. This will allow for a natural development to take place. A NAI policy for the Mercury Marina would also allow the creation of long stretch of river free from engineering works by joining the Satchel and Mercury Marshes of HAM 2 with the extensive marshes of HAM 3.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> Existing defences are in varying condition and could be maintained such as to being them back to their design standard. Particular attention needs to be given to the link between these defences and the undefended parts of the frontage to avoid outflanking and the intrusion of flood water from undefended areas. Defences may need to be raised in the future to provide adequate flood defence.</p> <p><i>Economics:</i> Again, losses in this Policy Unit would be minimal assuming Mercury Marina continues to operate at the owners cost.</p> <p><i>Environmental:</i> Little impact is anticipated from a hold the line policy.</p>			
Option 3 – Managed Realignment			
<p><i>Engineering:</i> The landward migration of the inundation level may require the construction of flood defences along the seaward property boundaries backing the Satchel and Mercury marshes in the future.</p> <p><i>Economics:</i> The initial financial cost to build set back defences could be seen to be high against the property being protected. It would also assume that the Marina would continue to operate at the land owners cost.</p> <p><i>Environmental:</i> Retreating the line by building defences along the seaward property boundaries backing the Satchel and Mercury marshes will eventually stop the roll back of the saltmarsh in response to sea level rise and will lead to coastal squeeze.</p>			

Policy Unit Details

HAM 2

Policy Options Discussion

The steel sheet pile defences for Mercury Marina are likely to be maintained by the marina operators. For the rest of the frontage in the short term a policy of NAI and ongoing monitoring of condition is likely to be the only viable policy. In the longer term it may be necessary to construct defences along the currently undefended frontages of Satchell Marshes, Mercury Gardens and St Agatha's Road as well as the adjoining caravan park to protect currently undefended property.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

Option 3: Managed Realignment

9.11 HAM3 – Badnam Creek to Lands End Lane

Policy Unit Details		HAM 3	
Policy Unit start	Badnam Creek	Policy Unit End	Lands End Lane
Grid Ref (start)	448530E, 108299N	Grid Ref (end)	449192E, 109231N
Brief Policy Unit Description			
The Policy Unit comprises of an extensive salt marsh area up to 300m wide that maintains a relatively natural appearance with different marsh and creek levels. The north eastern part shows a dominance of high marsh and the general appearance is one of a dissecting marsh. On the landward side, the marsh is backed by a gentle slope that reaches ~10mOD near the railway line.			
Defence Description			
Defence Status	Undefended	Defence Length	0m of 1574m
Defence type	N/A	Standard of protection	N/A
Residual Life	N/A	Land Use	Saltmarsh
Overall Asset Score	N/A	Flood map	Figure 31
Risk of Flooding			
The modelled flood area mapping shows the HAM3 Policy Unit as being vulnerable to flooding. Areas vulnerable to flooding include the boatyard adjacent to Mercury Marina. Recent LIDAR data shows that only the Lincegrove Marsh boathouse is located on land <3m OD.			
Risk of Erosion			
N/A			
Existing SMP Policy			
Do Nothing			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Managed Realignment			
Policy Options Consideration			
<p>Option 1 – No Active Intervention</p> <p><i>Engineering:</i> No existing defences.</p> <p><i>Economics:</i> No economic losses result from a No Active Intervention policy.</p> <p><i>Environmental:</i> Given sufficient sediment input, the marshes of HAM3 will grow vertically in response to sea level rise and the landward inundation limit will gradually move landwards.</p> <p>Option 2 – Managed Realignment</p> <p><i>Engineering:</i> As the ground rises behind the present inundation limit of the salt marsh, there is no need for engineering structures except to protect a small number of individual commercial premises. Inundation can be allowed to occur naturally over time with low capital scheme costs. Existing private defences could still be maintained under this option.</p> <p><i>Economics:</i> A scheme to construct a set back defence line would be a high initial cost with ongoing maintenance costs for the design life period.</p> <p><i>Environmental:</i> There is no useful limit to which to retreat the line as the only asset along the frontage is the railway line which runs at ~10mOD and which is not under any risk even in the long term given the assumed rate of sea level rise.</p>			
Policy Options Discussion			
The most likely strategy for this Policy Unit is No Active Intervention. This should be supported by a programme of regular monitoring of the extent and the condition of the salt marsh. If the existing salt marshes roll back due to sea level rise the primary asset at risk is the railway line. There is also the potential for outflanking at the boundaries with HAM2 and HAM4.			
The following options are to be taken forward to economic appraisal stage:			
Option 1: No Active Intervention			
Option 2: Managed Realignment			



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9.12 HAM4 – Lands End Lane to Swanwick Shore Road

Policy Unit Details		HAM 4	
Policy Unit start	Lands End Lane	Policy Unit End	Swanwick Shore Road
Grid Ref (start)	449192E, 109231N	Grid Ref (end)	449573E, 109194N
Brief Policy Unit Description			
The Policy Unit covers the western and eastern bank of the Hamble below Bridge Road Bridge and has defences along its entire length. Most of the Policy Unit is occupied by boatyards and marinas with residential properties along Lands End Road and Swanwick Shore Road.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	1190m of 2189m
Defence type	Sea wall (masonry / brick / concrete / steel sheet) / gabions / concrete block work revetment/ slipways	Standard of protection	1 in 10
Residual Life	11 – 20 years	Land Use	Industrial, residential
Overall Asset Score	4	Flood map	Figure 32
Risk of Flooding			
The modelled flood area mapping shows the whole of the HAM4 Policy Unit as being vulnerable to flooding. The southern end and northern frontage of Lands End Road, the coastal frontage of Bursledon Station, Bridge Road and the whole of Swanwick Marina and the houses on both sides of Swanwick Shore Road are all vulnerable to flooding. Recent LIDAR data shows that the houses east of the slipway at Swanwick Shore Road are on ground >3mOD and thus at a much lower risk of flooding. The existing defences only stabilise the bank and, as they do not rise above the bank, do not provide additional flood defence to that provided by the land elevation.			
Risk of Erosion			
In the long term, there is risk of erosion to the railway embankment on the on the western bank of the river and to Lands End Road.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<i>Engineering:</i> Over time the bank protection will deteriorate and erosion of the bank will commence. Rising water levels will lead to increased inundation of the low lying areas.			
<i>Economics:</i> The Swanwick Marina would be lost due to flooding along with several properties on the eastern and western banks of HAM4. This option would have a detrimental effect on local economy with the loss of the marina and the associated buildings.			
<i>Environmental:</i> Following the collapse of the bank protection and the increasing in flooding and inundation frequency, the area of Swanwick Marina will revert to become an intertidal area.			
Option 2 – Active Intervention			
<i>Engineering:</i> In the short term, the present bank protection needs to be improved, particularly along Lands End Road. In the medium and long term, the defences need to be raised to provide adequate flood protection to the low lying areas, in particular the Swanwick Marina.			
<i>Economics:</i> It would be assumed that Swanwick Marina would continue to operate at the cost of the land owner. It would also be assumed that the properties on the eastern and western banks of HAM4 would be defended at the cost of the private land owners.			
<i>Environmental:</i> There is little environmental gain by holding the line, the eastern bank as a highly engineered, vertical bank would remain just a few metres landwards from the present line. Retreating the line on the western bank could re-instate intertidal area.			
Option 3 – Managed Realignment			
<i>Engineering:</i> Retreat the line along Lands End Road would sacrifice 9 properties on the seawards side but save 8 properties on the landwards side of the road if the new line is drawn seaward of the road. Between Lands End Road and the bridge on the western bank, the line could be retreated to the toe of the railway embankment. Over time the toe of the embankment would need to be protected from bank erosion. On the eastern bank the natural retreat line (~3mOD) would			

Policy Unit Details

HAM 4

preserve Bridge Road and should also include Swanwick Shore Road.

Economics: Due to the close proximity of the properties along this Policy Unit, retreating the defended line would result in the loss of a number of buildings and property. There is not a feasible line to retreat the defence to on this frontage.

Environmental: There is little environmental gain by retreating the eastern bank as a highly engineered, vertical bank would remain just a few metres landwards from the present line. Retreating the line on the western bank could re-instate intertidal area.

Option Discussion

The Policy Unit is fully defended by mostly private defences which are likely to be maintained by their private owners. This is particularly the case for the large concerns such as the Swanwick Marina. Given the above the most applicable strategy for the Policy Unit is to 'Hold the Line' with the understanding that most of the defences along this frontage are privately owned and will need to be maintained by private owners.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

Option 3: Managed Realignment

9.13 HAM5 – Swanwick Shore Road to Universal Marina

Policy Unit Details		HAM 5	
Policy Unit start	Swanwick Shore Road	Policy Unit End	Universal Marina
Grid Ref (start)	449573E, 109194N	Grid Ref (end)	449158E, 108710N
Brief Policy Unit Description			
<p>The Policy Unit is largely undefended and consists of sloping ground in the northeast and low lying marsh backed by rising ground in the southwest. The almost natural and largely uninhabited frontage is only disrupted by the hard defences (brick wall) fronting Brooklands Farm. A footpath runs between the river and the higher ground in the eastern part, which has been defended by cobble filled gabions. The existing defences only stabilise the bank and do not provide additional flood defence to that provided by the land elevation.</p>			
Defence Description			
Defence Status	Defended (Part)	Defence Length	140m of 719m
Defence type	Cobble filled gabions / Brick walls	Standard of protection	1 in 5
Residual Life	5 – 10 years	Land Use	Mostly recreational
Overall Asset Score	2	Flood map	Figure 33
Risk of Flooding			
<p>The modelled flood area mapping shows the south-western part of the HAM5 Policy Unit as being vulnerable to flooding, particularly Brooklands Farm and the northern flank of Universal Marina.</p>			
Risk of Erosion			
<p>There exists an erosion risk for the edge of the saltmarsh area and the gabions fronting part of the coastal footpath indicate an erosion risk. This risk might be elevated by the fact that this part of the footpath protrudes into the Hamble.</p>			
Existing SMP Policy			
Do Nothing			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> The bank protection at Brooklands Farm and in front of the footpath will deteriorate with time leading to the loss of the coastal footpath which would need to be rerouted and loss of part of the grass area fronting Brooklands Farm.</p> <p><i>Economics:</i> The loss of the farm would result in limited economic loss, but would have a significant effect to the local economy.</p> <p><i>Environmental:</i> Allowing the bank erosion in front of the footpath will provide sediment for the frontage and will lead to a realignment of the bank to a natural plan shape. Similarly, the demise of the bank protection at Brooklands Farm will allow for a more natural alignment of the saltmarsh front.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> The present defences only protect the bank from erosion and have no impact on flood risk. Over time, bank protection would need to be replaced. If bank protection at Brooklands Farm is to fulfil a flood protection function, it would need to be raised to connect it with the higher ground landwards thereby encircling the properties.</p> <p><i>Economics:</i> It would be assumed that any defences protecting property on this frontage would be maintained by the private land owners.</p> <p><i>Environmental:</i> Given the natural evolution of the unprotected parts of the bank, the banks at Brooklands Farm and in front of the footpath will become increasingly misaligned, potentially affecting water flow in the Hamble and withholding sediment that could be used to help grow the remaining saltmarshes vertically.</p>			
Option 3 – Managed Realignment			
<p><i>Engineering:</i> Retreating the line of defence to a set back position would require the existing defences to be demolished and removed. There does not appear to be a clear line to which to retreat to on this frontage, although the defences fronting Brooklands Farm could retreat between 10-15m.</p> <p><i>Economics:</i> There would be high costs associated with removing the existing defences and installing new with very little benefit of protection.</p> <p><i>Environmental:</i> Setting back the defences at Brooklands Farm may regrade the shoreline to more natural bank but it is not thought it would provide any environmental benefits.</p>			

Policy Unit Details

HAM 5

Option Discussion

The only properties at risk are at Brooklands Farm, which are protected by recently constructed private defences. These assets are unlikely to generate sufficient benefit for the provision of defences under a publicly funded scheme. Consequently the most likely strategy for this Policy Unit is No Active Intervention, although under this policy private landowners should be able to continue to maintain their existing defences. Under a future flood scenario, Brooklands Farm will not be protected by its current defences as the wall does not join the higher ground.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

Option 3: Managed Realignment

9.14 HAM6 – Universal Marina

Policy Unit Details		HAM 6	
Policy Unit start	Universal Marina	Policy Unit End	Universal Marina
Grid Ref (start)	449158E, 108710N	Grid Ref (end)	448970E, 108519N
Brief Policy Unit Description			
The Policy Unit consists of the Universal Marina occupying ground between 2.5mOD and 3.5mOD. The existing defences only stabilise the bank and do not provide additional flood defence to that provided by the land elevation.			
Defence Description			
Defence Status	Defended	Defence Length	296m of 296m
Defence type	Timber breastwork / seawall (timber and sheet steel), earth embankment	Standard of protection	1 in 10
Residual Life	11– 20 years	Land Use	Industrial
Overall Asset Score	2	Flood map	Figure 34
Risk of Flooding			
The modelled flood area mapping shows the whole of the HAM6 Policy Unit as being vulnerable to flooding. Recent LIDAR data shows that most marina buildings are on ground >3mOD			
Risk of Erosion			
The bank protection indicates that there is a risk of erosion of the edge of the saltmarsh on which the marina is built.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<i>Engineering:</i> Over time, the bank protection will disintegrate and fail along this frontage, and the various engineered defences protecting Universal Marina will begin to fail leaving the frontage area dangerous to the public.			
<i>Economics:</i> The Policy Unit has no assets and property requiring any significant protection so the economic loss would be limited. The Universal Marina would continue activities at the owners cost.			
<i>Environmental:</i> The overall area would perhaps have a minor benefit from a more natural frontage if the defences were left to disintegrate, however it is not thought there would be any significant environmental benefits from doing nothing.			
Option 2 – Active Intervention			
<i>Engineering:</i> The existing defences would require maintenance every 10-15 years to prolong the life to provide adequate protection.			
<i>Economics:</i> It is expected that the Universal Marina would maintain the current various defences to continue the boating activities in the area. It would also be expected that defences protecting the car park would be maintained by the marina as it would be beneficial to the activities associated			
<i>Environmental:</i> There would be no benefit or detrimental effect to the environment with maintaining the current defences.			
Option 3 – Managed Realignment			
<i>Engineering:</i> There is not an adequate line to retreat to on this frontage, however should the Marina require higher flood protection in the long term it may be feasible to retreat back 10-15 meters and increase the protection height			
<i>Economics:</i> Again it would be expected that the Universal Marina would maintain the current various defences to continue the boating activities in the area. It			

Policy Unit Details	HAM 6
<p>would also be expected that defences protecting the car park would be maintained by the marina as it would be beneficial to the activities associated.</p> <p><i>Environmental:</i> There would be very little environmental benefit from a scheme retreating the defended line at the marina and car park.</p>	
Option discussion	
<p>The existing defences are the privately owned and constructed defences associated with the Universal Marina. Given the above the most applicable strategy for the Policy Unit is to 'Hold the Line' with the understanding that most of the defences along this frontage are privately owned and will need to be maintained by the marina owners.</p> <p>The following options are to be taken forward to economic appraisal stage:</p> <p>Option 1: No Active Intervention</p> <p>Option 2: Active Intervention</p> <p>Option 3: Managed Realignment</p>	

9.15 HAM7 – Universal Marina to Warsash North

Policy Unit Details		HAM 7	
Policy Unit start	Universal Marina	Policy Unit End	Warsash North
Grid Ref (start)	448970E, 108519N	Grid Ref (end)	448844E, 106508N
Brief Policy Unit Description			
The entire Policy Unit consists of saltmarsh backed by rising ground. The saltmarsh is fronted by an earth embankment, Bunny Meadow path, that is pierced at five locations. Additional intertidal marsh area exists in many places seawards of the embankment. Because the embankment is pierced in several locations, it does not provide any flood defence. None of the properties along this Policy Unit are located on ground <3mOD.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	1570m of 2354m
Defence type	Earth embankment	Standard of protection	1 in 5
Residual Life	6 – 10 years	Land Use	Saltmarsh
Overall Asset Score	2	Flood map	Figure 35
Risk of Flooding			
The modelled flood area mapping shows the whole of the HAM7 Policy Unit as being vulnerable to flooding. The most vulnerable properties are those which have a river frontage along Crableck Lane Path, Brook Avenue, Brook Lane and Thornton Avenue. However, recent LIDAR data shows that none of the residential properties are on ground <3mOD.			
Risk of Erosion			
The embankment is in many places at risk from erosion as evidenced by repair work.			
Existing SMP Policy			
Do Nothing			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<p><i>Engineering:</i> Over time, the embankment will fail in places due to erosion from the seaward side or in association with overtopping events, especially under rising sea levels. Once a breach has formed, this is likely to widen to provide less resistance to the tidal flows.</p> <p><i>Economics:</i> Following the first breach, the footpath along the top of the embankment will be disrupted reducing the amenity value.</p> <p><i>Environmental:</i> An increase in the number of gaps / breaches in the embankment will reduce flow velocity through each individual gap and reduce the amount of scour in the vicinity of the gap. The reduction in flow concentration will lead to some filling up of the main channels which in turn reduces flow velocities in these and the connecting channels providing more opportunity for sediment to settle and thus to contribute to vertical saltmarsh growth.</p>			
Option 2 – Active Intervention			
<p><i>Engineering:</i> Maintaining the current earth embankment would not provide any protection against flooding to the saltmarsh area landward. Currently there is no line to defend so a scheme to hold the existing line would require construction of new defences.</p>			

Policy Unit Details

HAM 7

Economics: Constructing new defences would involve high initial costs with ongoing maintenance costs which would be an ineffective use of public funds.

Environmental: The loss of Bunny Meadow path would result in lost amenity value, but could possibly benefit the saltmarsh landward as it rolls back.

Option 3 – Managed Realignment

Engineering: As there is no line to defend, there is no line to retreat. The natural retreat line would be the rising ground at the back of the marsh but as there are no assets to protect.

Economics: Installing set back defences would be a high initial cost with ongoing maintenance costs and this is unlikely to be a feasible option in terms of economics.

Environmental: There would not appear to be any environmental benefit to a scheme of retreating the defence line on this frontage.

Policy Options Discussion

The current embankment, topped by the footpath does not serve any flood defence function as it is already breached in several location, and has several pipes through the embankment which allow flow on an incoming and outgoing tide. The embankment may help to maintain the existing saltmarsh through reducing velocities of flows in this area. The area of marsh is backed by rising ground though there are some properties likely to be/become at risk of flooding.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

Option 3: Managed Realignment

9.16 HAM8 - Warsash North to Hook

Policy Unit Details		HAM 8	
Policy Unit start	Warsash North	Policy Unit End	Hook Park
Grid Ref (start)	448844E, 106508N	Grid Ref (end)	448808E, 105075N
Brief Policy Unit Description			
This Policy Unit covers the eastern bank of the Hamble to Hook Spit, enclosing the low lying areas of Warsash North and Newtown and the cliffs between. Most of the Policy Unit has defences against bank erosion. The existing defences only stabilise the bank and do not provide additional flood defence to that provided by the land elevation.			
Defence Description			
Defence Status	Defended (Part)	Defence Length	1150m of 1731m
Defence type	Sea wall (masonry / concrete)	Standard of protection	1 in 10
Residual Life	11 – 20 years	Land Use	Industrial, saltmarsh, agricultural.
Overall Asset Score	5	Flood map	Figure 36
Risk of Flooding			
The modelled flood area mapping shows the whole of the HAM8 Policy Unit as being vulnerable to flooding. From north to south the following properties are vulnerable to flooding:			
<ul style="list-style-type: none"> the bottom of the garden along Thornton Avenue, the whole of the Warsash marina frontage including Shore Rd, much of the College of Maritime Studies site, and the whole of the Hook Lake frontage. 			
Risk of Erosion			
The undefended cliffs between Warsash and Newtown are potentially at risk of erosion though at present the cliff is stable.			
Existing SMP Policy			
Hold the Existing Defence Line			
CDS Policy Options considered			
Option 1 – No Active Intervention			
Option 2 – Active Intervention			
Option 3 – Managed Realignment			
Policy Options Consideration			
Option 1 – No Active Intervention			
<i>Engineering:</i> Over the short term, the existing defences will disintegrate and fail and flood waters will inundate several properties along this Policy Unit.			
<i>Economics:</i> There are many properties that would be lost in a 'Do Nothing' scenario including the College of Maritime Studies. It would be expected that a losing property of this size will result in large economic losses, particularly those associated with the college.			
<i>Environmental:</i> Allowing the cliff between Warsash and Newton to retreat would provide sediment to the system that can be used to build up the remaining saltmarsh areas. The demise of the bank protection at Warsash is likely to lead to retreat of the water line to a more natural alignment with HAM7 to the north and the cliffs to the south. The demise of the protection at Newtown would re-instate the saltmarsh by fully connecting it to the Hamble River.			
Option 2 – Active Intervention			
<i>Engineering:</i> To maintain the line under rising sea levels the bank protection needs to be improved and raised to provide adequate flood protection. To maintain the line along the presently unprotected cliffs a new seawall would need to be built.			
<i>Economics:</i> Given the level of property requiring protection it would be expected that an adequate level of coastal defence will be constructed; therefore initial costs could be high with ongoing maintenance costs.			
<i>Environmental:</i> It is not expected that such a scheme would have any benefit or detrimental effect on the environment.			
Option 3 – Managed Realignment			
<i>Engineering:</i> Along the southern part of the Policy Unit it would be possible to retreat the line by removing the defences between the southern end of the College area and Hook Spit. The remaining defences could then be connected with the higher ground along the southern end of the College area to provide			

Policy Unit Details

HAM 8

continued protection. Along the Warsash frontage the defence line could be moved back to Shore Road, allowing for a more natural alignment of the frontage but maintaining flood protection for the residential properties landward of Shore Road.

Economics: The shortening of the defences south of the College area would reduce future capital and maintenance costs.

Environmental: The realignment of the Warsash frontage would provide a more natural alignment of the river bank, though maintaining this alignment would eventually lead again to an artificially maintained alignment. Realigning the defences along the College frontage would maintain protection to the assets of the college but allow the Hook Park area to evolve naturally.

Policy Options Discussion

There are substantial properties at risk from flooding along this frontage that would benefit from an Active Intervention policy, either to maintain or replace existing defences. The primary frontages to be defended would be the Warsash Marina frontage and the College of Maritime Studies frontage.

Along the frontage from Shore Road to the College of Maritime Studies, which is currently undefended, a short term policy of No Active Intervention could also be considered. However the adjacent defences to the north and south are likely to be outflanked and as a result, defences may need to be constructed along these sections. For the defences south of the College of Maritime studies options for Active Intervention with defences to protect the flanks of the College or set back defences and defend the flanks and access road to the college under a Managed Realignment policy.

The following options are to be taken forward to economic appraisal stage:

Option 1: No Active Intervention

Option 2: Active Intervention

Option 3: Managed Realignment

10 Economic Appraisal of Policy Options

A number of potential policy options for each Policy Unit have been assessed using FCERM-AG to determine the economic viability of the option. This Section provides summary information deriving from the economic appraisal of those options which have been taken forward from the Options Consideration stage (see **Section 9**). A number of potential policy options were discounted at that stage, either because they were technically unfeasible, there were no obvious benefits of the scheme or they were environmentally unacceptable under the Habitats Regulations Assessment.

The economic viability is based on calculations of likely costs of implementing a scheme and the ongoing costs of maintaining it over its entire design life (often up to 100 years) compared to the value of the assets that it would protect. The value of assets includes built and natural features and considers the national, regional and local importance of the asset, its possibility of and likely costs associated with relocating it, and factors such as the social and environmental implications of its loss.

Each of the following pages provides a summary of the economic appraisal calculations carried out for each Policy Unit. Full economic appraisal sheets are provided in **Appendix M**.

10.1 Scheme Costs

Each of the following pages provides a summary of the economic appraisal calculations carried out for each Policy Unit. Full economic appraisal sheets are provided in **Appendix L**. Costs entered in to the economic spreadsheets have associated breakdown for each cell within the spreadsheet i.e. the cost of building a length of manmade coastal defence has been calculated at £2,700 per meter (see below description). Where costs have been taken forward from the initial options assessments, a range of sources have been used to calculate including: -

- SPON'S Civil Engineering and Highway Works Price Book 2010
- drainage investigating contractors
- ground engineering contractors
- slope stability contractors
- previous similar schemes and options

For schemes requiring new or improved coastal defence assets, the Replacement costs for general defence types have been taken from the Environment Agency asset database which provides indicative costs. This suggests average replacement costs for linear structures (e.g. revetments, seawalls) as £2.7million/km and costs for beach management schemes at £5.1million/km. Groyne field costs are taken as £0.6million/km. These figures have been adjusted within the economic appraisal for local factors and appropriateness. Certain costs where it would not be appropriate to use linear structure costs have been sourced directly from contractor quotes.

Maintenance costs from the Defra National Appraisal of Defence Needs And Costs (NADNAC) study (2004) used annual maintenance costs for linear structures and for groyne fields at £10,000/km, and for beach schemes £20,000/km. These figures have

been adjusted for factors such as large vertical sea walls, where it would be unrealistic to apply a figure of 10,000/km for a structure of this type (and indeed many of the structures within this study area). Therefore, maintenance costs have been adjusted accordingly to reflect recent calculations such as Medium Term Plan figures submitted by LA's to the EA. Using SPON'S Civil Engineering and Highway Works Price Book 2010, previous schemes and the recent Medium Term Plan, an indicative cost of £1,500 per m has been calculated for maintenance for the defences for the entire study area. This approach ensures the EA has accurate figures which relate to the Medium Term Plan and actual construction costs using the bullet points above. It is strongly recommended that for any scheme proposed in this Strategy, Early Contractor Involvement (ECI) should be adopted at pre project appraisal stage to reduce uncertainty in construction costs.

10.2 Property prices

Property prices have been based on Council Tax Bands sourced from www.voa.gov.uk. The table below shows property prices derived from the Council Tax Bands which include indexing.

Table 10: Table showing property valuations derived from council tax bands

Council Tax Band (CTB)	Value at 1st April 1991	Minimum Value	Maximum Value	Median Value	CTB Median Value x multiplying factor of 2.394 (Source: Halifax Building Society) used for economic assessment
A	up to £40,000	£20,000.00	£40,000.00	£30,000.00	£71,815.72
B	up to £52,000	£40,001.00	£52,000.00	£46,000.50	£110,118.63
C	up to £68,000	£52,001.00	£68,000.00	£60,000.50	£143,632.63
D	up to £88,000	£68,001.00	£88,000.00	£78,000.50	£186,722.06
E	up to £120,000	£88,001.00	£120,000.00	£104,000.50	£248,962.35
F	up to £160,000	£120,001.00	£160,000.00	£140,000.50	£335,141.21
G	up to £320,000	£160,001.00	£320,000.00	£240,000.50	£574,526.94
H	over £320,000	£320,001.00	£640,000.00	£480,000.50	£1,149,052.69

National Trust owned property was priced on similar buildings which have been put up for sale at the time of this study.

10.3 Benefits

There are a number of other features which would benefit from the works to protect the study area and in particular the associated yachting and tourism industry. Most features fall within the consideration of income produced by yacht racing spectators and tourists to the area. **Appendix L** has considered the benefits mentioned in this Section.

Benefits have included an average income per person which was estimated from an example provided in the 'Manual of Assessment Techniques for Flood and Coastal Risk Management'.



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10.4 ITCH3 - Woodmill Lane Bridge to Cobden Bridge

The options assessed under the FCERM-AG are described in **Table 11** below. **Table 12** provides a summary of the results of the economic appraisal. **Table 13** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 11: ITCH3 Policy options to be assessed under FCERM-AG

Policy Unit: ITCH3	Option Description
Option 1 No Active Intervention	There are currently no assets at risk from erosion or flooding. Overtime, flood risk will increase to a small number of properties (gardens) at the southern end of the policy unit.
Option 2a Active Intervention (Maintain)	The existing masonry wall at the southern end of the policy unit will require periodic patching and repair to ensure continuation of the defence. In the long term the defence may need to be raised if structurally sound to provide a flood defence function as well as its current erosion purpose, as a result of increases in mean sea level.
Option 2b Active Intervention (Improve)	New erosion defences will need to be constructed at the northern end of the Policy Unit. These could take the form of an embankment (e.g. sloping masonry wall to link up to existing defences at the southern end of the Policy Unit) or steel sheet pile wall to limit the impact of new defences into the river. These would serve a flood defence function over time as sea level rise occurs.
Option 3 Managed Realignment	A managed realignment option could take the form of a new setback defence limited to protecting those properties at risk of flooding, in the long term, at the southern end of the frontage. As water levels rise over time, the parkland would be allowed to flood at a natural rate, constrained if necessary, by the set back defence line.

Table 12: ITCH3 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2a Active Intervention (Maintain)	Option 2b Active Intervention (Improve)	Option 3 Managed Realignment
PV costs	-	£134,818.38	£1,308,376.92	£352,109
PV Damages	£156,766.90	£1,192.13	£1,192.13	£1,192.13
PV benefits	-	£155,574.77	£155,574.77	£155,574.77
Net PV	-	£20,756.38	-£1,152,802.15	-£196,534
Benefit Cost	-	1.15	0.12	0.44

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 13: ITCH3 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
Defended Frontages	Maintain existing defences. Private landowners to continue with maintenance of their defences.		Maintenance of existing defences to be stopped. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.5 ITCH4 - Cobden Bridge to Weston Point

The options assessed under the FCERM-AG are described in **Table 14** below. **Table 15** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 16** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 14: ITCH4 Policy options to be assessed under FCERM-AG

Policy Unit: ITCH4	Option Description
Option 1 No Active Intervention	<p>The entire Policy Unit is heavily defended against flooding.</p> <p>Defences will fail over the short to medium term leading to increased flood risk to property which includes residential, commercial and infrastructure such as the Victoria Road Sewage Treatment Works.</p> <p>Sections of failing defences may require removal to ensure the safety of members of the public and to prevent unwanted debris entering the river.</p>
Option 2 Active Intervention (Maintain)	<p>Ad hoc repairs to existing defences which are of various types and of differing Standards of Protection to ensure the current level of flood protection continues to be provided.</p>
Option 3 Active Intervention (Improve)	<p>To provide a consistent level of flood protection, crest levels need to be raised to a common standard.</p> <p>Consideration of the multiple ownership of frontage should be taken into account when assessing the impact on public expenditure.</p> <p>Those areas that are currently more exposed could be protected by an extension to the existing sheet piling, to link up more recent defences constructed as part of new developments.</p>

Table 15: ITCH4 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Active Intervention (Maintain)	Option 3 Active Intervention (Improve)
PV costs	-	£677,789	£5,675,526
PV Damages	£238,382	£4,809	£1,812
PV benefits		£233,572	£236,569
Net PV	-	-£444,217	-£5,438,957
Benefit Cost	-	0.34	0.04

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 16: ITCH4 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
Defended Frontages	<p>Maintain existing defences.</p> <p>Private landowners to continue with maintenance of their defences.</p>		<p>Maintenance of existing defences to be stopped.</p> <p>Monitor the condition of existing assets.</p> <p>Remove failed defences as necessary for Health & Safety/Environmental reasons.</p> <p>Monitor the rate of erosion/deposition to provide data to inform future policy decisions.</p>
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.6 NET1 – Weston Point to Netley Castle

The options assessed under the FCERM-AG are described in **Table 17** below. **Table 18** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 19** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 17: NET1 Policy options to be assessed under FCERM-AG

Policy Unit: NET1	Option Description
Option 1 No Active Intervention	Loss of recreation area and coastal paths and access road. Potential exposure of hazardous materials from former landfill.
Option 2 Active Intervention (Maintain)	Beach recharge scheme along entire frontage and to realign foreshore with the rest of the coastal profile. Recharge would cover failed defences negating need for their repair/removal. Beach recharge would increase standard of protection to its former design standard. Potential source of suitably graded beach material from ABP dredging programme for 2010. Beach profile would require regular monitoring to ensure continued effectiveness. May require periodic top-up recharges (dependent on outcome of ongoing monitoring).
Option 3 Managed Realignment	Construction of new erosion protection defences at a set back line behind the current line of erosion. Ground investigation works required to determine content of former landfill and potential mitigation works associated with hazardous content. Loss of recreation area and coastal paths.

Table 18: NET1 summary of FCERM-AG assessment

Criteria	Option 1	Option 2	Option 3
	No Active Intervention	Active Intervention (Maintain)	Managed Realignment
PV costs	-	£1,876,508	£488,867
PV Damages	£28,139	£10,605	£213
PV benefits	-	£17,533	£27,925
Net PV	-	£1,858,974	-£460,942
Benefit Cost	-	0.01	0.06

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 19: NET1 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	MANAGED REALIGNMENT ²
Defended Frontages	Maintain existing defences. Private landowners to continue with maintenance of their defences. Note: Adaptive management does not become economically viable until Year 50. As such a maintain policy is appropriate in the short-medium term allowing time for steps to be put in place to move necessary infrastructure and to establish the content of the former landfill and take appropriate action for remediation.		Managed realignment. Private landowners to continue with maintenance of their defences.
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		Managed realignment.

² Policy difference between new SMP (2009, draft) and CDS (2009, Draft).

10.7 NET2 – Netley Castle to Netley Hard

The options assessed under the FCERM-AG are described in **Table 20** below. **Table 21** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 22** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 20: NET2 Policy options to be assessed under FCERM-AG

Policy Unit: NET2	Option Description
Option 1 No Active Intervention	The deterioration of existing defences is likely to pose Health & Safety risks requiring intervention. With the closest distance between properties and the cliff edge of ~15m it would take ~30 years for the erosion to reach the properties after the demise of the defences
Option 2a Active Intervention (Maintain 1)	Maintenance works to existing ad hoc defence structures to provide consistent Stand of Protection where there are existing defences. Options include concrete patching of existing defences. No new defences constructed under this option. Assumes private defences continue to be maintained by private landowners.
Option 2b Active Intervention (Maintain 2)	Beach recharge using suitably graded shingle deposited in front of existing defences and along the entire frontage would provide adequate defence for the short to medium term. Local sources of material should be used where available, for example by-products from the Southampton Water dredging programme by ABP.

Table 21: NET2 summary of FCERM-AG assessment

Criteria	Option 1	Option 2a	Option 2b
	No Active Intervention	Active Intervention (Maintain 1)	Active Intervention (Maintain 2)
PV costs	£0	£2,099,351	£1,928,376
PV Damages	£21,739,386	£696,967	£696,967
PV benefits	-	£21,042,419	£21,042,419
Net PV	-	18,943,068	£19,114,043
Benefit Cost	-	10.02	10.91

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 22: NET2 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
Defended Frontages	Maintain existing defences. Private landowners to continue with maintenance of their defences.		Maintenance of existing defences to be stopped. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.8 NET3 – Netley Hard to Cliff House

The options assessed under the FCERM-AG are described in **Table 23** below. **Table 24** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 25** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 23: NET3 Policy options to be assessed under FCERM-AG

Policy Unit: NET3	Option Description
Option 1 No Active Intervention	In the short to medium term, the existing defences fronting the Royal Victoria Country Park will fail. In the case of the defences along the western part of the frontage, these contain a substantial amount of concrete for the footpath at the crest which is likely to require the removal of some of the failing structures.
Option 2a Active Intervention (Maintain 1)	Maintenance of the existing defences could include works to repair the sheet pile and concrete wall and filling of voids behind. The low seawall towards the east could be raised to provide flooding protection in addition to its current erosion protection. A new a seawall could be built at the eastern end to protect the area from an increasing risk of flooding. This policy assumes private defences continue to be maintained by private landowners.
Option 2b Active Intervention (Maintain 2)	Beach recharge using suitably graded shingle deposited in front of existing defences and along the entire frontage would provide adequate defence for the short to medium term. Local sources of material should be used where available, for example by-products from the Southampton Water dredging programme by ABP.
Option 3 Managed Realignment	Option would require the relocation of the public access road and right of way and construction of new set back defences to provide future protection. An increase in public beach and mudflats/seaflats would maintain favourable status. Ongoing beach replenishment and re-profiling of the new beach material to maintain an effective beach profile and shoreline would be required.

Table 24: NET3 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2a Active Intervention (Maintain 1)	Option 2b Active Intervention (Maintain 2)	Option 3 Managed Realignment
PV costs	£0	£2,031,867	£1,615,090	£5,604,557
PV Damages	£12,411,362	£397,910	£397,910	£397,910
PV benefits		£12,013,452	£12,013,452	£12,013,452
Net PV	-	£9,981,585	£11,717,324	£6,408,895
Benefit Cost	-	6	7	2

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 25: NET3 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
Defended Frontages	Beach recharge and profiling of materials to provide erosion protection. Beach to be profiled to maximise benefits for recreation, and intertidal/subtidal habitat. Monitoring of beach stability and sediment transport. Relocation of infrastructure behind beach (access route, right of way, water pipes) to be investigated and instigated during this 50 year period.		Maintenance of existing defences to be stopped. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.9 NET4 – Cliff House to Ensign Industrial Park

The options assessed under the FCERM-AG are described in **Table 26** below. **Table 27** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 28** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 26: NET4 Policy options to be assessed under FCERM-AG

Policy Unit: NET4	Option Description
Option 1 No Active Intervention	No existing defence structures along this frontage. No measurable erosion or existing flood risk. No damages as a result of No Active Intervention policy option.
Option 2 Active Intervention (Maintain)	Beach recharge using suitably graded shingle deposited onto the existing beach could be used for sustainable maintenance and prevention of potential flooding adjacent to Mitchell Point. Local sources of material should be used where available, for example by-products from the Southampton Water dredging programme by ABP.

Table 27: NET4 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Active Intervention (Maintain)
PV costs	-	£222,929
PV Damages	-	-
PV benefits	-	-
Net PV	-	£222,929
Benefit Cost	-	-

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 28: NET4 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
Defended Frontages	Not applicable as no defended frontages in this policy unit.		
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.10 NET5 – Ensign Industrial Park and Hamble Oil Terminal

The options assessed under the FCERM-AG are described in **Table 29** below. **Table 30** provides a summary of the results of the economic appraisal. **Table 31** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 29: NET5 Policy options to be assessed under FCERM-AG

Policy Unit: NET5	Option Description
Option 1 No Active Intervention	Significant areas of industrial premises would be affected by an increase in flood risk as a result of deteriorating defences. Of particular concern is the Oil Refinery at Hamble which may have implications for pollution during a flood event. Existing defences would need to be removed at the end of their lifespan.
Option 2a Active Intervention (Maintain)	Existing defences to be maintained and repaired as required continuing the current level of protection.
Option 2b Active Intervention (Improve)	Defences would be raised (e.g. addition of a concrete cap on existing steel sheet piling) to increase the level of flood protection provided to the Oil Terminal. New defences may be required to either side of the terminal to avoid outflanking over time due to sea level rise. Depending on future development of the foreshore, hard structures may be required in front of the embankment to protect it from erosion.

Table 30: NET5 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2a Active Intervention (Maintain)	Option 2b Active Intervention (Improve)
PV costs	-	£1,863,870	£2,453,551
PV Damages	£60,218	£3,223	£457
PV benefits	-	£56,994	£59,760
Net PV	-	-£1,806,876	-£2,393,791
Benefit Cost	-	0.03	0.02

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 31: NET5 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
Defended Frontages	Maintain existing defences. Private landowners to continue with maintenance of their defences.		Maintenance of existing defences to be stopped. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.11 NET6 – Hamble Oil Terminal to Hamble Common Point

The options assessed under the FCERM-AG are described in **Table 32** below. **Table 33** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 34** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 32: NET6 Policy options to be assessed under FCERM-AG

Policy Unit: NET6	Option Description
Option 1 No Active Intervention	Erosion defences at the Oil terminal and the Marina will last for the next 20 years and will hold the line in these places. After 20 years the defences would decay and breakdown completely and offer no protection to these assets.
Option 2a Active Intervention (Maintain)	<p>No new defences to be constructed under this option. Repair of existing defences to bring back up to their design standard and increase the length of time that they offer protection.</p> <p>Flood prevention needs to take into account the policy for the HAM1 Policy Unit to prevent flooding from the north.</p>
Option 2b Active Intervention (Improve)	<p>Extension of the Rock Revetment from the marina to the west to cover the full extent of NET6 and join with NET5. This would protect Marina activities but is unlikely to attract public funding due to the commercial nature of the site.</p> <p>To maintain the existing line Construction of new coastal erosion and flood defences along the Hamble Common frontage to prevent the retreat of the low cliff and to protect the area from flooding.</p>

Table 33: NET6 summary of FCERM-AG assessment

Criteria	Option 1	Option 2a	Option 2b
	No Active Intervention	Active Intervention (Maintain)	Active Intervention (Improve)
PV costs	-	£519,186.83	£910,424.93
PV Damages	£2,813.99	£150.65	£21.40
PV benefits	-	£2,663.35	£2,792.60
Net PV	-	-£516,523.49	-£907,632.33
Benefit Cost	-	0.01	0.00

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 34: NET6 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
Defended Frontages	<p>Maintenance of existing defences to be stopped.</p> <p>Monitor the condition of existing assets.</p> <p>Remove failed defences as necessary for Health & Safety/Environmental reasons.</p> <p>Monitor the rate of erosion/deposition to provide data to inform future policy decisions</p>		
Undefended Frontages	<p>Monitor the rate of erosion/deposition to provide data to inform future policy decisions.</p>		

10.12 HAM1 – Hamble Common Point to Satchell Marshes

The options assessed under the FCERM-AG are described in **Table 35** below. **Table 36** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 37** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 35: HAM1 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 1	Option Description
Option 1 No Active Intervention	In the short to medium term the bank protection is likely to fail, allowing bank erosion to commence, though this is unlikely to severely affect any property. Flooding will be limited to the Rope Walk area affecting a number of residential and commercial properties.
Option 2 Active Intervention (Improve)	No new defences to be constructed under this option. Repair of existing defences to reinstate to original design standards and increase the length of time that they offer protection. In some locations the defences could be raised to increase the Standard of Protection offered in line with climate change. Flood Gates to be installed at two slipways which currently provide a low point in defences allowing frequent flooding to occur. Existing defences to continue to be maintained by private landowners.
Option 3 Managed Realignment	Construction of new set back defences to protect properties to the south of Green Lane, including The Quay and Rope Walk from current and future flooding. Existing defences to continue to be maintained by private landowners such as at Hamble Point Marina, Hamble-le-Rice and Port Hamble frontages.

Table 36: HAM1 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Active Intervention (Improve)	Option 3 Managed Realignment
PV costs	-	£254,301	£244,079
PV Damages	£256,813	£13,748	£1,952
PV benefits	-	£243,064	£254,860
Net PV	-	-£11,236	£10,781
Benefit Cost	-	0.96	1.04

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 37: HAM1 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT ³
Defended Frontages	Maintenance of existing defences to be stopped. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions. Private landowners may continue to maintain existing defences.		Managed realignment. Construction of new set back defences where required.
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		Managed realignment. Construction of new set back defences where required.

³ Policy difference between new SMP (2009, draft) and CDS (2009, Draft).

10.13 HAM2 – Satchell Marshes to Badnam Creek

The options assessed under the *FCERM-AG* are described in **Table 38** below. **Table 39** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 40** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 38: HAM2 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 2	Option Description
Option 1 No Active Intervention	The bank protection along Mercury Marina will deteriorate over the next 20 years leading to a collapse of part of the Marina frontage to create a more natural slope than the present 5m vertical drop. Following this initial bank erosion, a more natural development in line with the higher ground just south of the Marina can be expected.
Option 2 Active Intervention (Maintain)	Repair of existing defences to bring back up to their design standard an increase the length of time that they offer protection. No new defences to be constructed at undefended locations under this option. Mercury Marina operators to continue to manage their own defences through private funding.
Option 3 Managed Realignment	Under this option existing defences could continue to be maintained (as above). Over time as sea levels rise, new defences could be constructed to the north of Mercury Marina to provide ongoing protection in the long term.

Table 39: HAM2 summary of FCERM-AG assessment

Criteria	Option 1	Option 2	Option 3
	No Active Intervention	Active Intervention (Maintain)	Managed Realignment
PV costs	-	£25,000	£83,501
PV Damages	£17,202	£920	£130
PV benefits	-	£16,281	£17,071
Net PV	-	-£8,718	-£66,429
Benefit Cost	-	0.65	0.20

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 40: HAM2 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
Defended Frontages	Maintenance of existing defences to be stopped. Private landowners may continue to maintain existing defences to ensure continued operation, for example at Mercury Marina. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.14 HAM3 – Badnam Creek to Lands End Lane

The options assessed under the *FCERM-AG* are described in **Table 41** below. **Table 42** provides a summary of the results of the economic appraisal. **Table 43** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 41: HAM3 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 3	Option Description
Option 1 No Active Intervention	Under a No Active Intervention policy, the existing salt marshes will roll back in a landward direction due to sea level rise. The only major asset along the frontage is the railway line which runs at ~10mOD and which is not under any flood risk even in the long term given the assumed rate of sea level rise.
Option 2 Managed Realignment	Construction of localised set back erosion defences to protect individual premises which may become at greater risk of erosion over time.

Table 42: HAM3 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Managed Realignment
PV costs	-	£111,124
PV Damages	£31,517	£239.68
PV benefits	-	£31,278
Net PV	-	£79,846.
Benefit Cost	-	0.28

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 43: HAM3 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
Defended Frontages	Maintenance of existing defences to be stopped. Private landowners may continue to maintain existing defences to ensure continued operation, for example at Mercury Marina. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.15 HAM4 – Lands End Lane to Swanwick Shore Road

The options assessed under the *FCERM-AG* are described in **Table 44** below. **Table 45** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 46** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 44: HAM4 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 4	Option Description
Option 1 No Active Intervention	Over time the bank protection will deteriorate and erosion of the bank will commence. Rising water levels will lead to increased inundation of the low lying areas. Following the collapse of the bank protection and the increasing in flooding and inundation frequency, the area of Swanwick Marina will revert to become an intertidal area. Marina operations would continue at owner's costs.
Option 2 Active Intervention (Maintain)	In the short term, the present bank protection could be repaired, particularly along Lands End Road providing adequate protection. In the medium and long term, the defences may need to be raised to provide adequate flood protection to the low lying areas, in particular at Swanwick Marina.
Option 3 Managed Realignment	Erosion could be allowed to occur naturally with toe protection added to provide defence on a set back line to protect main assets that will become at risk in the longer term. On the eastern bank the natural retreat line (~3mOD) would preserve Bridge Road and should also include Swanwick Shore Road.

Table 45: HAM4 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Active Intervention (Maintain)	Option 3 Managed Realignment
PV costs	-	£78,303	£142,356
PV Damages	£163,618	£14,268	£14,268
PV benefits	-	£149,350	£149,350
Net PV	-	£71,046	£6,993
Benefit Cost	-	1.91	1.05

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 46: HAM4 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)
Defended Frontages	Maintain existing defences. Private landowners to continue with maintenance of their defences.		
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

10.16 HAM5 – Swanwick Shore Road to Universal Marina

The options assessed under the *FCERM-AG* are described in **Table 47** below. **Table 48** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 49** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 47: HAM5 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 5	Option Description
Option 1 No Active Intervention	The bank protection at Brooklands Farm and in front of the footpath will deteriorate with time leading to the loss of the coastal footpath, which would need to be rerouted, and loss of part of the grassed area fronting Brooklands Farm. It should be noted that within this option Hampshire County Council will need to consider a way forward in order to decide on a sustainable option for the future of the Bunny Meadows footpath..
Option 2 Active Intervention (Maintain)	The present defences are designed to protect the bank from erosion. They are currently effective against present and future flood risk. Over time bank protection may need to be replaced as its condition deteriorates.
Option 3 Managed Realignment	Retreating the existing line would see the low lying areas inundated with flood water with new set back defences required to protect property in the long term.

Table 48: HAM5 summary of FCERM-AG assessment

Criteria	Option 1	Option 2	Option 3
	No Active Intervention	Active Intervention (Maintain)	Managed Realignment
PV costs	-	£54,236.80	£101,855.85
PV Damages	£1,645.72	£12.51	£12.51
PV benefits	-	£1,633.20	£1,633.20
Net PV	-	-£52,603.60	-£100,222.65
Benefit Cost	-	0.03	0.02

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 49: HAM5 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
Defended Frontages	Maintenance of existing defences to be stopped. Hampshire County Council will investigate options for retention of the footpath. Private landowners may continue to maintain existing defences to ensure continued operation, for example at Mercury Marina. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions. Hampshire County Council will investigate options for retention of the footpath.		

10.17 HAM6 – Universal Marina

The options assessed under the *FCERM-AG* are described in **Table 50** below. **Table 51** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 52** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 50: HAM6 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 6	Option Description
Option 1 No Active Intervention	Under this option defences will be allowed to fail over time. Private landowners can continue with the maintenance of their defences under this Policy Option.
Option 2 Active Intervention (Maintain)	Existing defences will continue to be maintained. Private landowners can continue with the maintenance of their defences under this Policy Option.
Option 3 Managed Realignment	Managed realignment would be carried out at the medium term stage (50 years) when flood levels begin to inundate the frontage and benefits of such a scheme begin to be realised. This option assumes privately owned defences are maintained by their owners but with costs associated with the managed realignment borne by the local authority.

Table 51: HAM6 summary of FCERM-AG assessment

Criteria	Option 1	Option 2	Option 3
	No Active Intervention	Active Intervention (Maintain)	Managed Realignment
PV costs	-	£23,809	£14,679
PV Damages	£1,367	£73.20	£10.40
PV benefits	-	£1,294	£1,356
Net PV	-	-£22,515	-£13,322
Benefit Cost	-	0.05	0.09

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 52: HAM6 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT
Defended Frontages	Maintenance of existing defences to be stopped. Private landowners may continue to maintain existing defences to ensure continued operation, for example at Mercury Marina. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		Managed realignment. Construction of new set back defences where required.
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		Managed realignment. Construction of new set back defences where required.

10.18 HAM7 – Universal Marina to Warsash North

The options assessed under the *FCERM-AG* are described in **Table 53** below. **Table 54** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 55** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 53: HAM7 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 7	Option Description
Option 1 No Active Intervention	Over time, the embankment will fail in places due to erosion from the seaward side or in association with overtopping events, especially under rising sea levels. Once a breach has formed, this is likely to widen to provide less resistance to the tidal flows. Following the first breach, the footpath along the top of the embankment will be disrupted reducing the amenity value. An increase in the number of gaps / breaches in the embankment will reduce flow velocity through each individual gap and reduce the amount of scour in the vicinity of the gap. The reduction in flow concentration will lead to some filling up of the main channels which in turn reduces flow velocities in these and the connecting channels providing more opportunity for sediment to settle and thus to contribute to vertical saltmarsh growth. It should be noted that within this option Hampshire County Council will need to consider a way forward in order to decide on a sustainable option for the future of the Bunny Meadows footpath.
Option 2 Active Intervention (Improve)	A revetment could be installed to add further protection to the Hamble Ferry Terminal, the cost of which should be assumed to be borne by the private owners.
Option 3 Managed Realignment	The retreat line would be provided the rising ground at the back of the existing marshland which will occur naturally. The costs associated with a managed realignment policy option would be low. This option assumes private defences continue to be maintained by private landowners in accordance with a managed realignment plan for this area.

Table 54: HAM7 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Active Intervention (Improve)	Option 3 Managed Realignment
PV costs	-	£10,476	£92,268
PV Damages	£61	£0.47	£0.47
PV benefits	-	£61	£61
Net PV	-	-£10,414	-£92,207
Benefit Cost	-	0.01	0.00

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 55: HAM7 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
Defended Frontages	Maintenance of existing defences to be stopped. Private landowners may continue to maintain existing defences to ensure continued operation, for example at Mercury Marina. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions. Hampshire County Council will investigate options for retention of the footpath.		

10.19 HAM8 - Warsash North to Hook

The options assessed under the *FCERM-AG* are described in **Table 56** below. **Table 57** provides a summary of the results of the economic appraisal. The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit. **Table 58** then provides details of the recommended option derived as a result of this assessment together with the earlier consideration of options (see **Section 9**) and the assessment of options under the Habitats Regulations (see **Appendix K**).

Table 56: HAM8 Policy options to be assessed under FCERM-AG

Policy Unit: HAM 8	Option Description
Option 1 No Active Intervention	Allowing the cliff between Warsash and Newton to retreat would provide sediment to the system that will aid in the build up of the saltmarsh areas. The demise of the bank protection at Warsash is likely to lead to retreat of the water line to a more natural alignment with HAM7 to the north and the cliffs to the south. The demise of the protection at Newtown would reinstate the saltmarsh by fully connecting it to the Hamble River.
Option 2 Active Intervention (Improve)	To maintain the line under rising sea levels the bank protection needs to be improved and raised to provide adequate flood protection. To maintain the line along the presently unprotected cliffs a new seawall would need to be built.
Option 3 Managed Realignment	Along the southern part of the frontage it would be possible to retreat the line by removing the defences between the southern end of the College area and Hook Spit and connecting the existing defences with the higher ground along the southern end of the College area to provide continued protection. Along the Warsash frontage the defence line would maintain flood protection for the promenade, car park and residential properties landward of Shore Road. The shortening of the defences south of the College area would reduce future capital and maintenance costs. The realignment of the Warsash frontage would provide a more natural alignment of the river bank, though maintaining this alignment would eventually lead again to an artificially maintained alignment. Realigning the defences along the College frontage would maintain protection of the assets of the college but allow the Hook Park area to evolve naturally. Further investigation will be required into the managed realignment policy to assess the best approach in future.

Table 57: HAM8 summary of FCERM-AG assessment

Criteria	Option 1 No Active Intervention	Option 2 Active Intervention (Improve)	Option 3 Managed Realignment
PV costs	-	£428,154	£523,987
PV Damages	£13,851	£218	£105
PV benefits	-	£13,632	£13,746
Net PV	-	-£414,522	-£510,240
Benefit Cost	-	0.03	0.03

The recommended policy option is described below. The recommended policy option is the most sustainable way to manage the coastline in this Policy Unit.

Table 58: HAM8 recommended policy option

	Recommended policy option		
	Short term:	Medium term:	Long term:
	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT	MANAGED REALIGNMENT
Defended Frontages	Maintenance of existing defences to be stopped. Private landowners may continue to maintain existing defences to ensure continued operation, for example at Mercury Marina. Monitor the condition of existing assets. Remove failed defences as necessary for Health & Safety/Environmental reasons. Monitor the rate of erosion/deposition to provide data to inform future policy decisions.	Managed realignment scheme with private defences maintained by private land owners.	
Undefended Frontages	Monitor the rate of erosion/deposition to provide data to inform future policy decisions.		

11 Recommended Policy Options

Table 59 below summarises the recommended policy option for each Policy Unit[‡]. Each policy option for each Policy Unit has been considered using the environmental appraisals (SEA and HRA), Policy Options development (See **Section 8** and **Section 9**) and the economic appraisal (see **Section 10**).

[‡] *We have used our reasonable endeavours to provide information that is correct and accurate and have in this report the reasonable conclusions that can be reached on the basis of the information available.*



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Table 59: Summary of recommended policy options for each Policy Unit

Policy Unit	Existing SMP Policy (1998 approved)	New SMP Policy (2009, draft)			Study Proposed Policy		
		Short Term (0-20 years)	Medium Term (20-50 years)	Long Term (50-100 year)	Short Term (0-20 years)	Medium Term (20-50 years)	Long Term (50-100 year)
ITCH3	Hold Existing Defence Line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
ITCH4	Hold Existing Defence Line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
NET1	Hold Existing Defence Line or Retreat existing defence line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	*ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	*MANAGED REALIGNMENT
NET2	Hold Existing Defence Line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
NET3	Retreat Existing Defence Line or Hold existing defence line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
NET4	Retreat Existing Defence Line	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
NET5	Hold Existing Defence Line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	NO ACTIVE INTERVENTION
NET6	Hold Existing Defence Line	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
HAM1	Hold Existing Defence Line	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	*NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	*MANAGED REALIGNMENT
HAM2	Retreat Existing Defence Line	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
HAM3	Do Nothing	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
HAM4	Retreat Existing Defence Line	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)	ACTIVE INTERVENTION (MAINTAIN)

Policy Unit	Existing SMP Policy (1998 approved)	New SMP Policy (2009, draft)			Study Proposed Policy		
		Short Term (0-20 years)	Medium Term (20-50 years)	Long Term (50-100 year)	Short Term (0-20 years)	Medium Term (20-50 years)	Long Term (50-100 year)
HAM5	Do Nothing	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
HAM6	Hold Existing Defence Line	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT
HAM7	Do Nothing	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION	NO ACTIVE INTERVENTION
HAM8	Hold Existing Defence Line	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT	MANAGED REALIGNMENT	NO ACTIVE INTERVENTION	MANAGED REALIGNMENT	MANAGED REALIGNMENT

*Policy difference between new SMP (2009, draft) and CDS (2009, Draft).

12 Action Plan (0-20 years)

Table 60 details actions necessary within the next 20 years to enable the recommended policy options to be implemented. A timeframe for the delivery of these actions has been provided together with estimated costs for this work, to enable each of the responsible authorities to secure funding to carry out these actions.

Table 60: Action Plan (0-20 years)

Policy Unit	Recommended Policy Option (0-20 year period)	Action Plan					
		0-5 years		5-10 years		10-20 years	
		Action	Estimated Cost	Action	Estimated Cost	Action	Estimated Cost
ITCH3	ACTIVE INTERVENTION (MAINTAIN)	Revetment along Riverside Park to be monitored annually.	£3,000 per annum	Revetment along Riverside Park to be monitored annually.	£3,500 per annum	Revetment along Riverside Park to be monitored annually.	£4,000 per annum
		Notify landowners of their responsibilities to protect their own property (Year 1)	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property. (every 5 years)	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
ITCH4	ACTIVE INTERVENTION (MAINTAIN)	Notify Network Rail and landowners of their responsibilities to protect their assets and/or property against flooding and erosion.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property. (every 5 years)	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
NET1	ACTIVE INTERVENTION (MAINTAIN)	The relic land fill site located on the frontage and is possibly at risk of eroding and causing potential diffuse pollution to Southampton Water. Therefore ground investigation is required to assess the levels of toxic material that could enter Southampton Water as a result of flooding and coastal erosion	£60,000	Annual monitoring of risk of pollution incidents from the relic land fill site	£10,000 per annum	Annual monitoring of risk of pollution incidents from the relic land fill site	£11,000 per annum

Policy Unit	Recommended Policy Option (0-20 year period)	Action Plan					
		0-5 years		5-10 years		10-20 years	
		Action	Estimated Cost	Action	Estimated Cost	Action	Estimated Cost
NET2	ACTIVE INTERVENTION (MAINTAIN)	NET2 Policy Unit requires maintenance to defences through refurbishment of existing defences. Note: It should be considered for future management that ABP have offered suitably graded shingle at nil cost for a beach replenishment scheme at Policy Units NET2 and NET3. ABP dredged material will be available 2010. Using the graded shingle at nil cost would greatly reduce the capital cost of this scheme. A beach recharge scheme would also be an integrated approach with NET3 where the CDS indicates a recharge scheme.	£560,000	Monitor beach levels to ensure imported beach material continues to provide adequate defences against flood and erosion to properties (every 5 years).	£10,000	Monitor beach levels to ensure imported beach material continues to provide adequate defences against flood and erosion to properties (every 5 years).	£10,000
NET3	ACTIVE INTERVENTION (MAINTAIN)	NET3 Policy Unit requires maintenance to defences through nourishment of the existing beach. Note: It should be considered for future management that ABP have offered suitably graded shingle at nil cost for a beach replenishment scheme at Policy Units NET2 and NET3. ABP dredged material will be available 2010. Using the graded shingle at nil cost in conjunction with NET2 would provide an integrated approach and greatly reduce the capital cost of the required scheme.	£1,630,000	Monitor beach levels to ensure imported beach material continues to provide adequate defences against flood and erosion to properties (every 5 years).	£10,000	Monitor beach levels to ensure imported beach material continues to provide adequate defences against flood and erosion to properties (every 5 years).	£10,000
NET4	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion,	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion,	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion,	£4,000 per annum
		Commission a study to determine the suitability of the land adjacent to the Hamble Oil Terminal as a habitat creation/enhancement.	£25,000	-	-	-	-
NET5	ACTIVE INTERVENTION (MAINTAIN)	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum

Policy Unit	Recommended Policy Option (0-20 year period)	Action Plan					
		0-5 years		5-10 years		10-20 years	
		Action	Estimated Cost	Action	Estimated Cost	Action	Estimated Cost
NET6	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM1	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM2	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM3	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM4	ACTIVE INTERVENTION (MAINTAIN)	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM5	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000

Policy Unit	Recommended Policy Option (0-20 year period)	Action Plan					
		0-5 years		5-10 years		10-20 years	
		Action	Estimated Cost	Action	Estimated Cost	Action	Estimated Cost
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion. Investigate options to decide sustainable future for the Bunny Meadows coastal tpath (HCC lead).	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM6	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM7	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion. Investigate future options for Bunny Meadows coastal path (HCC lead)	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
HAM8	NO ACTIVE INTERVENTION	Notify landowners of their responsibilities to protect their property.	£1,000	Notify landowners of their responsibilities to protect their own property (every 5 years)	£1,500	Notify landowners of their responsibilities to protect their own property (every 5 years).	£2,000
		Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£3,000 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion. Further investigation of managed realignment to future guidance on options.	£3,500 per annum	Monitoring and identification of public safety issues arising from coastal flooding and erosion.	£4,000 per annum
		Total estimated costs (0-5 years)	£2,498,000	Total estimated costs (5-10 years)	£329,000	Total estimated costs (10-20years)	£716,000