

**WESTERN SOLENT
COASTAL DEFENCE STRATEGY**

**NOTES ON THE
LYMINGTON & KEYHAVEN SALTMARSHES**

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Lymington & Keyhaven saltmarshes

The north western shore of the Solent is renowned for its outstanding scenic beauty, ecological significance and archaeological importance. However, concern for the long term survival of the Lymington to Keyhaven saltmarshes has increased in recent years, as the saltmarshes are rapidly eroding. The saltmarshes and mudflats are eroding due to a combination of factors, some of which are little understood. The main factors are thought to be:

- Wave action
- Sea level rise and climate change
- Waterlogging of estuarine soils
- Vegetation dieback
- Lack of sediment supply
- Tidal currents

Why the saltmarshes are so important

The saltmarshes and inter tidal mudflats are vitally important for Coast Protection, Nature Conservation and the Local Economy. Sustainable saltmarsh management needs to balance the often conflicting socio-economic requirements of commercial, recreational and coastal defence needs with nature conservation interests.

Coast Protection and Flood Defence

Wide, shallow inter tidal foreshores and saltmarshes provide an effective, natural method of flood protection to 10km of coastline, between Keyhaven and Sowley. They are an integral part of the coastal defence system within the Western Solent, absorbing the energy, and reducing the damaging effect of storm waves. The wide, shallow inter tidal foreshores and saltmarshes provide an effective natural method of flood protection to 10km of coastline, between Keyhaven and Sowley. They are an integral part of the coastal defence system within the Western Solent, absorbing the energy, and reducing the damaging effects of storm waves.

The saltmarsh islands at the mouths of the Lymington and Keyhaven Rivers act as natural dissipators of wave energy, providing protection from waves that would otherwise continue straight up these rivers. These natural defences absorb much of the force that the hard defences would otherwise have to resist. This effectively forms a two tier coastal defence with the saltmarshes as the first line of defence.

Nature Conservation

The north west shore of the Solent is an internationally important area in terms of nature conservation, especially for bird populations. The Lymington to Keyhaven saltmarshes and the low lying land behind the coastal defences contains nationally and internationally important habitats, which are protected by European and national environmental legislation.

The 1979 Directive on Conservation of Wild Birds 79/409/EEC (The Birds Directive), implemented in the UK by the Wildlife & Countryside Act 1981, refers to the

preservation, maintenance and re establishment of habitats for certain means of protecting bird populations through designations of Special Protection Areas (SPAs).

The 1992 Directive on Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) (the Habitats Directive) requires member states to set up an ecological network (the Natura 2000 network) of Special Areas of Conservation (SACs). Implementation of the Habitats Directive in the UK is through the Conservation (Natural Habitats &c) Regulations 1994.

The entire inter tidal zone of the Solent area falls within the Solent Maritime candidate Special Area of Conservation (cSAC). The saltmarsh and inter tidal habitats are included in the Solent and Southampton Water Special Protection Area (SPA) and Ramsar site. The Lymington estuary is included in the South Hampshire Coast Area of Outstanding Natural Beauty (AONB); the Lymington River is also included in a Site of Importance for Nature Conservation (SINC). There are also a number of National Nature Reserves (NNR) and Site of Special Scientific Interest (SSSI).

The saltmarsh mudflat system forms a significant wildlife habitat, with an internationally significant feeding population of dark bellied Brent Geese. The saltmarshes, shingle spits and chenier shell banks support nationally important wintering and breeding populations of waders, terns and gulls. They also provide important resting and feeding habitats, essential for wintering and migratory waterfowl.

Local Economy

Recreation sailing has become increasingly popular in the Solent. The Lymington River has two major marinas, 3 boatyards and 5 sailing clubs. The Lymington to Yarmouth ferry service is crucial to the economy of the region, particularly in terms of tourism and commercial trade. Ship and boat traffic is concentrated in the Lymington River, and recreational activities occur in some of the inter tidal creek channels.

Effects on Coast Protection

The natural landward migration of saltmarsh systems, under rising sea levels, is often prevented; this is due to the presence of defence structures, such as sea walls and revetments, and the proximity of urban and coastal developments. This process termed coastal squeeze, results in the rapid erosion and degradation of these natural flood defences, and increased risk of flooding and coastal erosion. Maintaining existing flood defences in a situation where a seawall is fronted by an eroding saltmarsh will eventually lead to coastal squeeze with the complete loss of saltmarsh habitat if alternatives are not considered.

The existing coastal and flood defence between Keyhaven and Lymington were designed on the basis of a saltmarsh fronting them, in order to provide an adequate level of protection from the effects associated with climate change and sea level rise. If there were no saltmarshes in front of the coastal defences, the standards of protection would be reduced. Enormous financial costs would also be incurred in maintaining the existing sea defences. New and alternative means of protecting the towns from severe flooding may well need to be redesigned or upgraded.

If no action is taken to protect the saltmarshes and inter tidal mudflats, they will continue to erode and degrade. They will only provide lower standards of natural flood protection to the harbours and seawalls for perhaps another 50 years.

Effects on wildlife

The north west Solent coastline is host to a wide variety of plants, wildlife and habitats, many of which are considered to be of European importance to nature conservation. These areas are protected by a number of national and European nature conservation legislation.

The designation of most of the coastal area within the West Solent SMP has implications for the future management of the coastal defences. There is a need to meet the obligations of European legislation relating to protecting the site integrity and the favourable conservation status of species and habitats, in the context of evolving coastal systems within which habitats are being created and lost as a result of natural processes.

An important aspect for saltmarsh systems management is that erosion of the saltmarsh and inter tidal foreshore represents a natural response to sea level rise and climate change. Saltmarsh and inter tidal mudflats are of equal importance in terms of biodiversity and nature conservation. Loss of saltmarsh may reduce high water roosting or nesting sites, but ecological benefits may be gained through the creation of larger areas of inter tidal mudflats, which provide particularly valuable feeding sites for over wintering birds, or the creation of isolated islands of saltmarsh and shingle-shell ridges (cheniers) for nesting.

However, these mudflats may only be temporary features within an evolving estuary. If the saltmarshes and mudflats were to disappear, it would have devastating implications on internationally important bird populations, and for the overall health of plant and marine life. The loss of one part of a migratory feeding route may destroy the integrity of the entire network.

Effects on Local Economy

The local economy is largely dependent on marine activities. Increased wave exposure reaching further into the estuaries has already affected the number and position of yacht moorings. If the saltmarshes continue to disappear even more moorings in the outer reaches of the river would be lost. Safety within the harbour and marinas would also be affected.

If conditions within the harbour continue to deteriorate it could damage tourism and commercial activities. The vibrancy, prosperity and character of the local town will become threatened if appropriate action to save the saltmarshes and mudflats is not taken.

This would have major economic impacts for the region, affecting commercial interests and tourism. The loss of saltmarsh and mudflats would also seriously damage the wildlife habitats, which in turn would adversely affect the character of the area.

Strategic Coastal Management

The Department for the Environment, Food and Rural Affairs (DEFRA) formerly the Ministry of Agriculture Fisheries and Food (MAFF) is the government department with overall policy responsibility for flood defence and coast protection in England. The Coast Protection Act (1949) establishes Maritime District Councils as “Coast Protection Authorities” and vests in them general permissive powers to carry out “coast protection work”.

In 1995 MAFF set out a strategic management framework for coast protection to encourage better cooperation between local authorities and coastal stakeholders, and to ensure a holistic approach to coast protection and flood defence. This strategic approach required all local maritime authorities to develop Shoreline Management Plans (SMPs), and subsequently Coastal Defence Strategies. Although the framework is non statutory, any organization that does not participate within the SMP management framework will not be awarded DEFRA grant funding towards the cost of coast protection schemes.

SMPs usually cross the boundaries of several local authorities and are developed in partnership with these operating authorities. NFDC is a partner in 2 SMPs: the Western Solent and Southampton Water SMP and the Poole and Christchurch Bays SMP.

Process Units and Management Units

The key to achieving effective management of the shoreline is knowledge of coastal processes and their interaction along the coast. A framework of Process Units and Management Units has been developed to enable sustainable shoreline management and coastal defence strategies to be established for the future.

A Process Unit represents a section of coastline that possesses coherent coastal process characteristics, which are sufficiently independent of adjacent stretches of shoreline. Parameters such as waves and tidal currents have been appraised along with geological and geomorphological features to establish these process based divisions.

A management unit is a length of shoreline that requires a specific coastal defence option to meet the overall requirements for the Process Unit.

The Western Solent, from Hurst Castle to the tip of Calshot Spit is a single Process Unit, which has been sub divided into 14 Management Units.

There are four strategic coastal management policy options assigned to each Management Unit within an SMP; these are: Hold the existing defence line; do nothing; advance the defence line; and managed retreat.

West Solent Coastal Defence Strategy Study

A Coastal Defence Strategy is the instrument for detailed implementation of an SMP. The need for a Coastal Defence Strategy to be developed has been identified previously within the Western Solent and Southampton Water Shoreline Management Plan (SMP). NFDC is currently developing 2 Coastal Strategy Plans. One for Christchurch Bay and one for the Western Solent. The Christchurch Bay Strategy Study began in 2001.

The Western Solent Coastal Defence Strategy Study has been identified in the NFDC Development Programme, and an application for grant approval from DEFRA has been submitted. It is expected that the funding will be available early in the financial year beginning April 2002.

The Strategy will produce recommendations for intervention, if appropriate, over a 50 year period.

The Strategy Study will comprise a series of coastal processes, environmental and economic studies leading to the development of a Coastal Defence Strategy for the coastline extending from Hurst Castle to the tip of Calshot Spit. The landward extent of the Study will be land at risk from erosion and /or flooding to the year 2070 and any land to be taken into account in relevant cost:benefit analyses. The seaward limit is the 15m Chart Datum contour of the seabed.

The Coastal Strategy will:

- (i) Provide the high level basis for decision making and action relating to the provision and management of flood or coastal defences, to protect assets and conservation resources;
- (ii) Include detailed environmental and economic assessments of management options and a range of technical solutions
- (iii) Investigate all potential management techniques, including hard and soft engineering options. This will include innovative techniques such as recycling dredged sediment;
- (iv) Examine the role of Hurst Spit and the role of the saltmarshes as strategic features providing natural protection to and within the West Solent;
- (v) Examine the wide range of coastal management policies on privately owned frontages on the north west Solent shore
- (vi) Investigate and assess all potential techniques for the management of existing defence structures including their eventual removal or replacement.

Adopting a holistic management approach ensures that coastal erosion and flooding problems are dealt with in a strategic manner, rather than on a parochial local basis.

The output from a Strategy Study is a prioritized programme of works and management programmes, including preferred engineering options if appropriate, which usually have a managed design life of 50 years. Coast protection schemes are specific capital projects that arise from strategy studies.

Environmental Assessment

Appropriate and Environmental Impact Assessments for any works proposed within a conservation designated site are requirements of European and national environmental legislation. Such assessments aid the planning process by identifying the potential impacts on the natural environment. They are required for any proposed managed intervention that may affect the health and favourable conservation status of designated sites.

Economic Assessment

A benefit:cost assessment for each Management Unit will be performed, with particular attention being given to the inter relation of combined schemes, for example transition zones between hold the line and do nothing policy frontages. This economic analysis will determine whether any proposed coast protection scheme is economically justifiable or should be rejected. Benefits of a scheme must outweigh the cost for permission and funding to be granted. Schemes should provide best value for money by considering capital, maintenance and risk of unforeseen expenditure.

Consultation

A key element for effective coastal management is consultation. NFDC continues to establish and develop excellent communication links with government departments and agencies, local authorities, research centres, landowners and other stakeholders. Consultation is a continuous process for any coastal protection scheme or field trial that results from coastal strategy studies.

NFDC as lead authority is already working in partnership with English Nature, the Environment Agency, Lymington Harbour Commissioners, Hampshire County Council and conservation organizations to develop a sustainable strategy to safeguard the long term future of the saltmarshes. The management of the Lymington to Keyhaven saltmarshes is crucial in the development of the Coastal Strategy for the West Solent.

Management Options

Any coastal protection and flood defence scheme must be technically and economically sound, and environmentally acceptable

“Hard” engineering management techniques

“Hard” engineered coast protection works such as seawalls, breakwaters and revetments often conflict with natural processes. They require expensive repairs and regular maintenance in order to continue providing an adequate level of coast and flood protection. Such techniques may not provide cost effective and environmentally acceptable solutions. In many locations, for example the flood defences between Lymington and Keyhaven, “hard” engineered structures are designed on the basis of saltmarshes and mudflats remaining in front of them.

All “hard” engineered coastal defence options will be investigated and assessed as part of the Coastal Strategy, with the aim of protecting assets, and conserving nature conservation resources.

“Soft” engineering management techniques

“Soft” engineering management techniques, for example recycling dredged material manipulates natural processes rather than confining them. They could provide the potential to allow the coast to evolve more naturally, and may be more cost effective to implement. However, the application of soft engineering techniques to saltmarsh and mudflat environments is limited and experimental studies and field trials are required. However, field trials must be carefully designed and developed, in conjunction with an

intensive monitoring programme, before these innovative techniques are implemented on a larger scale.

Inter tidal recharge is the term used to describe the artificial raising of inter tidal areas with imported sediment to a threshold elevation above which vegetation can naturally gain a foothold. Beneficially “recycling” dredged sediments for habitat enhancement schemes, and retaining the material within the estuarine system may increase the supply of sediment available for sedimentation processes, and may generate substantial local and regional socio-economic benefits.

Sediment deriving from marina or harbour maintenance dredging is either polluted or is perceived to be so publicly. It may typically contain contaminants arising from industrial, agricultural and domestic uses. The presence of toxic substances in dredged materials, such as heavy metal concentrations, can have a long term effect on the intertidal and near shore ecosystems.

Habitat restoration locations that would be the most feasible as re-use sites for dredged material often already provide important habitats. With almost any habitat restoration project using dredged material, creating “new” habitat invariably means losing some other type of habitat.

Monitoring

An intensive monitoring programme has been coordinated and conducted by the in house coastal survey team. From this monitoring it has been possible to calculate and extrapolate the coastal erosion rates to predict possible future shoreline positions. Results from the monitoring and research programme allow risk assessments to be developed for each management unit, and collectively as a Process Unit. This environmental and economic implications associated with these risks can then be evaluated.

Monitoring is essential for developing methods of assessing environmental resources and understanding how the managed and natural environments function. Information derived from monitoring is used to inform and implement appropriate management measures. Extensive research, and flexible and cost effective monitoring is critical to any saltmarsh and inter tidal foreshore management strategy, as it is for all coast protection schemes. Information exchange, data transfer and dissemination are fundamental tools for the viability of any saltmarsh restoration plan, to justify management and measure change.

NFDC Coastal Group has an extensive monitoring programme in place in order to advance the understanding of the physical, ecological and socio-economic environments encountered in the coastal zone.

The survey programme comprises field based remote sensing and environmental surveys to provide detailed baseline digital mapping of marine and terrestrial environments. Techniques include collection and analysis of topographic and bathymetric data, hydrodynamic data (wind, wave condition, tidal level and climate), vegetation mapping, sediment types and budgets and archaeological information.

Long-term monitoring and analysis by NFDC Coastal Group has shown that the seaward edges of the saltmarshes are eroding on average at 3m per year. The rates of saltmarsh and mudflat erosion are likely to increase due to the effects of global climate change and sea level rise, which will increase the risk of flooding to coastal areas. Historical maps and recent aerial photography show 734 hectares of saltmarsh in 1921, but only 297 hectares in 1994. Research undertaken by NFDC Coastal Group indicates that with no intervention to reduce or halt the rate of saltmarsh erosion, the saltmarshes will provide a decreasing amount of protection to the harbours and seawalls for perhaps another 50 years, and will have completely disappeared by the end of this century or sooner.

The NFDC Weather Station located on the Racing Platform at the mouth of the Lymington River records tide level, wind speed and direction and barometric pressure. This data is automatically transmitted to the Coastal Group where it is analysed and archived.

The waverider buoy, located in Christchurch Bay measures the characteristics of the waves and telemeters the data to the Town Hall offices "as it happens". The wave data is shown here as a monthly time series dataset.

The "real time" data gathered from the monitoring equipment is analysed and is used both in the design of new coastal engineering schemes and for emergency planning when flooding may be a problem.

A baseline bathymetric survey of the West Solent frontage from Hurst to Calshot has been completed in 2001. The area from Hurst to Sowley, including the Lymington River, has been surveyed by NFDC numerous times in the last decade. This data and data from other marine contractors has been collated, and digital terrain models of the sea bed and inter tidal zone have been generated and analysed. Cross section profiles of the seabed have also been drawn. The cross section profiles that extend from one saltmarsh bank to the other across the main Lymington River channel indicate that the river mouth is widening and the inter tidal flats are deepening. However, they also show the main navigation channel is maintaining a constant depth.

A range of survey techniques is used for collection of shoreline topographic data. These include land based techniques, aerial photogrammetry and other airborne remote sensing methods such as LIDAR. An annual aerial photogrammetric survey is carried out and provides contact prints for visual interpretation and digital georectified photos for use in a GIS.

Kinematic GPS is capable of collecting data with centimeter accuracy and is ideally suited for beach surveying. Baseline topographic surveys and cross section beach profiles are conducted to determine changes in beach volume, gradient and width. Where possible pre and post storm beach surveys are carried out to further understand the dynamic effects of storm waves on sediment transport and coastal processes.

LIDAR (which stands for Light Detection and Ranging) is an airborne mapping technique which uses a laser to measure the distance between the aircraft and the ground. Surveys produce a swathe of data with a width of about 700m, producing millions of georeferenced XYZ data points on a single survey. The aircraft is positioned and navigated using satellite GPS. This technique results in the production of a cost

effective terrain map for large areas which can be easily interpreted within a GIS. Remote sensing techniques such as LIDAR are potentially cost effective methods of mapping areas that are highly fragmented, such as saltmarsh islands and creek networks, and which may pose access and logistical problems. Remote sensing gives good spatial data but it must also be balanced with ground based data collected at a similar time.

In order to understand how the physical processes impact on the natural environment data is required on sediments, flora and fauna. In most areas, good quality baseline information on sediment types, sediment transport, abundance and distribution of species and populations is lacking. NFDC have already undertaken vegetation surveys for the saltmarshes and Hurst Spit, with the data available on a GIS. In areas such as saltmarshes, establishing and quantifying the species present is vital in terms of determining which management techniques would best apply in that area, as well as contributing to nature conservation objectives. This information will be analysed with respect to predicted shoreline evolution to establish vegetation losses and the impact on the designated conservation areas. Surveys of bird populations, especially breeding and over wintering birds, using count data to establish bird carrying capacity of the existing habitats will help to identify areas which are particularly important and environmentally sensitive.

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