Part E

PART E : FUTURE DEVELOPMENT

CONTENTS

1 INTRODUCTION

Previous chapters of this document have presented a strategy for the defence of the coastline of Poole and Christchurch Bays. As such this represents the project team's best assessment of the information made available and further analysis and studies undertaken during the course of the commission. However, it is essential that for any plan such as this to be successful, it must remain responsive to change. The need for change may be a consequence of a reappraisal of local or national coastal defence and planning guidelines, the influence of ever changing environmental considerations or it may be the result of improved understanding of the natural processes which are driving the evolution of the coast.

This chapter describes where and how such understanding needs to be improved and gives a suggested time frame for both the review of the strategies and, further into the future, for a more comprehensive reappraisal of the Plan as a whole. This theme of taking matters forward is further advanced by introducing what is the next stage in the process of more effective shoreline management.

2 MONITORING REQUIREMENTS

2.1 Monitoring

In order for shoreline management to be carried out effectively, monitoring of the coastline and the natural processes influencing it is essential. Previous monitoring around the UK has often been undertaken on an *ad hoc* basis, aimed at meeting short term needs rather than providing the broader outlook necessary for a plan such as this one. Even in instances where longer term more comprehensive monitoring programmes have been implemented they have sometimes been poorly managed to the extent that much of the data produced is considered unreliable or is not easily accessible. For example in the case of beach profiles there are a number of instances around the UK where data has been shown to be flawed because the start point of a profile has not been consistently and accurately established. In other cases the alignment of the profile has been left unrecorded or imprecisely defined, leaving to memory or judgement the appropriate orientation of the survey teams when collecting data across a given stretch of beach. The fact that such errors passed unnoticed at the time and did not manifest themselves until later could indicate one of two things. Either little has been done with the data at the time of collection (possibly because those responsible did not have ready access to the earlier data and/or software that allowed a rapid comparative analysis); or the data appeared to offer sufficient confirmation of the anticipated trend to negate any obvious need for detailed enquiry.

Whilst the importance of monitoring has been well understood for many decades it is only in the last ten years that the value of having a properly established and structured monitoring programme has been recognised. Monitoring is important as a key component of the increasing number of soft engineering schemes in which the beach is an integral part of the defences. In such cases it is vital that impacts resulting from external influences such as climate change are detected early and any problem averted. Such programmes are now being developed and implemented all over the UK, as funding permits. The costs are relatively low, given that the data that is produced enables a more informed design, and hence there is the potential for the quick return of any expenditure through the more cost-efficient design of coastal defence schemes or the more effective management of finite maintenance resources. The increase in access to computers, and the range of software products that have accompanied this, are integral to the change of emphasis. However, it is the realisation that insufficient reliable long time-scale data exists, limiting the credibility of the interpretations upon which strategies have been based, that is now the catalyst for introducing such programmes. The range of monitoring that is currently undertaken, its effectiveness and suggestions as to how it might be improved in the future are explored further in the paragraphs that follow.

2.2 Existing Monitoring

Parts of Poole and Christchurch Bay have been monitored for a considerable period. The Department of Environment funded Poole and Christchurch Bays research project (Halcrow, 1980) was instigated in 1974. It set up beach profiles in Poole and Christchurch Bay, which have been continued by Bournemouth, Christchurch and New Forest councils, providing a valuable record for the future.

Reliable long term monitoring data around the coast is variable. The following provides an overview of the key areas that are presently monitored indicating areas that would benefit from improved attention to detail and quality:

- The Environment Agency's Annual Beach Monitoring Survey of the south coast of England (covering Hurst Spit to Highcliffe within this SMP area) - this survey has since its inception in 1978 established an enviable photographic record of the coastline which it is hoped can continue. The profiles derived by photogrammetry from stereoscopic pairs are providing inconsistent results which to date have been of minimal value. However, in certain locations the quality of the profile can be verified against a known hard structure, although the open undefended coast often remains of uncertain quality. A key problem with the survey appears to have been that the Agency have not had available to them an effective means by which the quality of the latest batch of data can be measured against that of preceding years. However, an analysis of the survey for the entire EA Southern Region in 1994 stated that current ground checking of the profiles have compared well, although it was noted that Hampshire was the area in which results were least consistent. It remains to be seen whether recent measures that have been taken to improve the quality of the data will be successful.

- New Forest District Council's Beach Survey - this is a more comprehensive and detailed photogrammetric record than that carried out by the Environment Agency. The resulting profiles incorporate information on the salt marshes and cliffs as well as the beach. A photogrammetric survey in 1994 covered the whole New Forest coast between Chewton Bunny and Calshot Spit, this is complemented by a longer series of data that has been recorded for key locations. Since 1987, quarterly surveys have been made of Hurst Spit and Milford along with annual hydrographic survey which ties in with the summer profile. Barton has also been surveyed quarterly since 1989. This represents an extensive data set of quarterly beach profiles gathered using land survey techniques.

- The Environment Agency's Sea Defence Survey - though there are no extensive sea defences around the length of coast under examination, this data set still provides important strategic information on the structures which provide protection against flooding around the coast. The Coast Protection Survey of England (CPSE) carried out in 1993 picked up some of the flood defence structures. In the near future an attempt should be made to filter out the major inconsistencies, duplications and omissions between the SDS and CPSE defence databases, which should be updated.

- The Ministry of Agriculture's Coast Protection Survey of England - in a similar way to the Sea Defence Survey above, this data set provides important strategic information on structures which fulfil a coast protection function around the length of coast in question. MAFF have chosen to keep the database current by asking local authorities to provide an annual update of the information pertaining to their area. In spite of its importance to the Plan, inconsistencies still remain. Closer

attention needs to be given in the future to ensure that the database accurately reflects the nature and condition of such defences.

- Water Level Data - On-going time series data exists at several directly relevant sites on the coast. POL have recently installed a Class A tide Gauge on Bournemouth Pier, Poole Harbour Commissioners have gauges at Poole Quay, RoRo Berth and North Haven Point (1991-present) within Poole Harbour, Christchurch Borough Council have a gauge at Mudeford Quay since 1990 and Priory Quay (confluence of River Avon & Stour) since 1996. Another is operated by New Forest District Council, at the mouth of the Lymington River. However, most of these have only been in operation for a limited time (less than five years) and have been noted as having gaps or inconsistencies in the records. Measures to ensure the quality of the data should be investigated.

- Wave Climate - data is gathered in real time at a waverider buoy located off Milford-on-Sea. This buoy was relocated to a new position in 1996. Waverider buoys have previously been located off Southbourne (St Catherines Path) (1974 - 1978), Mudeford Sandbank and Poole Sandbanks.

- Bournemouth Borough Council's Beach Monitoring – Since July 1974 a high quality record of beach profile and particle size distribution measurements has been maintained. The biannual beach profiles are in two parts, a topographic survey above MLW and a hydrographic survey that extends from MHW to 450m seaward of the origin (a pin on the seawall). Particle site distribution sampling has been undertaken at 8 of the 38 profiles, at MHW, MLW and the offshore bar. Annual aerial photographs are also collected, for occasional generation into data by photogrammetry.

- Christchurch Borough Council – There have been occasional beach profile surveys related to schemes, particularly at Highcliffe and Mudeford Sandbank. In addition, Southampton University undertake annual beach profile surveys on the profiles established in 1974 by Halcrow for the DoE funded research. These have not been analysed in depth to date. Annual aerial photographs are also collected.

- Poole Harbour Commissioners – Regular bathymetric surveys are undertaken within Poole Harbour and the Swash Channel, primarily of channels for navigation, to assist in identification of maintenance (and occasionally capital) dredging requirements. Less frequent surveys of mudflat areas are also undertaken.

- Poole Borough Council – A beach profile monitoring programme has been established recently for Poole Sandbanks. Photographs are regularly taken on the remaining open coast and compared to groyne heights.

2.3 Future Monitoring

The following recommendations relate to the key areas of monitoring considered necessary. However, this should not preclude more local or specific monitoring

should it be required. This could possibly be as a result of recommendations resulting from local studies, or the maintaining of storm event records such as site specific overtopping, flooding or damage.

2.3.1 Beach Profile Surveys

Beaches provide the natural form of forward defence around much of the SMP coastline. They play an important role in maintaining the integrity of both natural coastline features such as soft cliffs as well as artificial manmade coastal structures. It is therefore desirable that as much as possible is known about their susceptibility to change. It is proposed that initially a comprehensive set of beach profiles should be obtained on a bi-annual basis at specific locations identified for individual Management Units in earlier chapters. These would include Swanage Bay, Studland Bay and Poole Sandbanks to Alum Chine in particular. The beach profiles will need to link to bathymetric surveys to give a comprehensive picture of shoreline behaviour.

For the Durley Chine to Hengistbury Head and Naish Farm to Hurst Spit frontages the existing beach profile survey programmes provide sufficient information.

It is proposed that the summer profiles should be taken ideally in July or August. In the Hampshire area, this will also tie in to the Environment Agency Southern Region's photogrammetric analysis and will act to 'ground truth' the Agency's annual survey, providing that they are timed close together. The locations identified against the Management Units in Hampshire have been specifically selected to coincide with the Agency's profiles. The winter profiles should be taken in January or February. The exception to the above is the Poole Bay frontage where the monitoring programme should continue to use the Autumn and Spring timings established by Bournemouth BC.

In the first instance the full programme proposed should be adopted, however, there is likely to be scope for the number of profiles to be cut back once an initial idea of trends has been established (anticipated after two years of surveys). Studies to check the ground control and methodology of the Environment Agency Southern Region survey should also be undertaken in order to improve its quality and perhaps validate the historical record. After five years the full programme should be reviewed to ascertain whether the Environment Agency's Southern Region programme as re-established offers a viable alternative in terms of data quality for the Naish Farm to Hurst Spit frontage. The benefit of maintaining the EA Southern programme would be the long term record. All such data can very usefully be stored and analysed systematically within a suitable computer system.

At present both the Environment Agency and New Forest District Council survey the coast between Naish Farm and Hurst Spit. Concerns over the quality and coverage of the Environment Agency's survey have led to New Forest District Council undertaking their own separate surveys. Spatial problems exist with the present Environment Agency survey in that profiles do not extend beyond the toe of the beach to give full coverage of the intertidal zone, do not cover all natural features such as saltmarshes and mudflats and do not always fully cover backing cliffs. It is proposed that in order to remove this duplication of effort, the two authorities will need to liaise between themselves in order to rationalise the Environment Agency survey so that it meets the requirements of both organisations involved. This will essentially involve addressing the above mentioned coverage problems, and the question of accuracy, which aimed to be

resolved by undertaking the proposed 'ground truthing' profiles. This data can then be used to monitor cliff changes as well as those of the beach itself.

In Swanage, Studland and Poole Bay (Poole Sandbanks), beach profile locations should coincide with previous survey locations such as the BP Hook Island work and Halcrow 1998 Swanage Surveys.

2.3.2 River Surveys

The present monitoring regime, and that outlined above, do not cover the River Frome or the River Piddle. The Rivers Stour and Avon are covered by the Environment Agency's monitoring programme. It is proposed that within these rivers annual cross-channel profiles are undertaken at three locations. These are to cover both the river banks and bathymetric survey of the river bed. As such any changes in river hydrodynamics, and any effects of defence strategies or sea level rise can be assessed.

2.3.3 Saltmarsh Surveys

Information on saltmarsh change within Poole Harbour, particularly on the south side, over time is extremely limited. Profile surveys of key locations should be considered. Photogrammetry and mapping of vegetation communities as well as topographic features should be undertaken every 10 years. The priority is to establish a good baseline survey against which future change can be measured.

2.3.4 Bathymetric Profile Surveys

The bathymetry of the nearshore zone influences wave activity and hence the exposure of the coastline through its morphological shape, steepness and presence of other features such as banks and inshore intertidal flats. The bathymetric topography around the nearshore is varied with sandbanks in particular having notable effect on the bathymetric depths. It is proposed that in order to better model the nearshore wave climate and energy levels a selection of the beach profiles should be extended offshore for up to 2kms or out to 10mCD, whichever occurs more seaward. For example Hook Sands and the Poole Harbour training bank are areas where data is required for coastal processes understanding. The exercise should generally be repeated at approximately one year intervals. However, the areas fronting saltmarshes are highly dynamic and here it is advisable to carry out annual hydrographic surveys, from the marsh edge to the 5mCD contour, which will link through to the saltmarsh strategy outlined in section 3.4. Similarly Hook Sands is dynamic and biannual surveys would be necessary at that location. The work will need to be integrated to the ongoing monitoring of seabed by Poole Harbour Commissioners, Bournemouth Borough Council and New Forest District Council. It is noted that PHC may begin to increase monitoring of Hook Sands in the near future.

2.3.5 Defence Condition Surveys

The monitoring of the effectiveness and residual life of all existing defence structures is important in order to evaluate the risk of failure and enable adequate measures to be taken to limit the extent and nature of such risk. A programme of regular inspection is proposed whereby the condition of each structure will be assessed and any damage and deterioration recorded. This should ideally be undertaken in September to allow the results of the survey to feed into the annual update of the Coast Protection Survey. Where such structures have been

considered to be in a bad or poor condition, an additional survey in April of each year should be undertaken. A series of photographs illustrating the condition of such defences and of the fronting beach should be referenced within these reports. The defence surveys should be linked to beach monitoring as in many situations the beach is an integral part of the defence.

2.3.6 Wave Conditions

Waves are a key factor in the evolution of the study coastline, generating sediment supply through erosion of cliffs, beaches and the seabed. They move sediment within the confines of each Process Unit and beyond as they break on the beaches and contribute considerably to the general deterioration of structures. Such damage includes direct damage that the wave energy imparts, the potential for damage caused by overtopping, and further the potential for beach material to be removed. Knowing and understanding wave conditions is a key component of effective shoreline management. Christchurch Bay is well covered by the waverider buoy at Milford, however wave rider buoys deployed for a number of years in order to provide statistically valid and representative data off Southbourne and Poole Sandbanks would assist design. Despite published data for the wave climate for the area being available there is still only a limited amount of data identified considering the large number of schemes designed over the past few decades. The present waverider at Milford should be maintained to cover Christchurch Bay.

2.3.7 Water Level Conditions

As stated earlier, a particular concern of the project team has been the very limited reliable water level data that has been identified particularly on the open coast. An important feature of the proposed monitoring programme is therefore the expansion of knowledge in this particular area. Though extensive amounts of effort have in the past been expended in desk studies, a more fundamental appraisal in the field is believed to be warranted. In the first instance, the reliability of the existing gauges already mentioned needs to be resolved. It is important that resources are available to ensure continued operation (and periodic re-calibration/validation) of the existing gauges at Poole, Bournemouth, Christchurch and Lymington such that they build valuable long term records for the future and may be effective in detecting climate change impacts etc.

Consideration should also be given to installing additional gauges to enhance available knowledge at strategic positions along the coast. These could be limited to deployments of up to five weeks at say three additional locations. Likely sites would include Swanage, Barton, Mudeford Sandbank/Hengistbury Head. These would act to quantify the relationship of water levels in these areas to those at the established water level recording stations. In addition it is recommended that the existing longer term recording stations be recalibrated to ensure the quality of their future measurements. New Forest District Council have recently installed a tide gauge on the open coast side of Hurst Spit. As the record at the Bournemouth Pier extends, extreme estimates for Poole Bay will improve in accuracy.

2.3.8 Cliff Monitoring

Cliff failure within Christchurch Bay, and particularly at Barton-on-Sea, is linked not only to toe erosion caused by direct wave attack, but also significantly to geotechnical properties and precipitation levels. Cliff material permeability and

porosity are integral components of instability within this subcell, and these issues should not be understated. Similarly, within Swanage Bay, the cliffs of New Swanage are eroding due primarily to groundwater problems. It is vitally important that cliff stability be monitored, particularly in locations where there are properties close to the cliff top, such as at Barton, Swanage and Milford. Monitoring equipment such as piezometers and inclinometers record shifts in position or slope of the ground or cliff face, along with fixed position displacement devices. Such devices could form the basis of an early warning system as well as improving the understanding of the instability process. Ground water flow through cliff drainage systems should also be monitored in order to identify periods when saturation conditions may occur.

2.3.9 Data Storage and Monitoring Co-ordination

When implementing a monitoring strategy, an appropriate medium for storing and handling the vast quantities of data that will be generated is vital. In order to enable any relationships or impacts to be assessed, it is important that disparate data sets can be interlinked in digital form. A medium which can accommodate all of the various data acquired through the monitoring, whilst at the same time maximising easy accessibility and hence usage, is clearly an advantage. A suitable system can offer a cost effective solution in this respect.

New Forest DC have recently established a data storage system based on Halcrow's Shoreline and Nearshore Data System (SANDS) whilst Bournemouth BC are considering whether their storage system needs to be upgraded. It is proposed that data storage and monitoring is most effectively and efficiently undertaken by dedicated staff with extensive experience of managing such data systems and monitoring programmes. For Poole Bay, Bournemouth BC are proposed as data management and monitoring co-ordination centre whilst New Forest DC would undertake the same function for Christchurch Bay. Both centres would work on behalf of and be jointly funded by all Coastal Group members.

Linked to the above, collaboration between organisations generally needs to be improved for exchange of present and future data sets. Some data sets remain difficult to gain access to, due to ownership or commercial restrictions.

It may also be useful for monitoring to be undertaken using common methods across the SCOPAC region.

3 FURTHER STUDIES AND DATA REQUIREMENTS

An important aspect of the SMP development is the identification of gaps in knowledge and the research studies or data acquisition that should be carried out to fill them. For the most part these are addressed through the expansion and formalisation of the monitoring programme already described. Any additional studies that would further such aims are described in the sections which follow. It should be noted that they would benefit from some feedback from the monitoring programme described above.

Many of the studies proposed involve significant regional dimensions and would be relevant to the interests of many of the SMP project groups on the central south coast of England. It is recommended that opportunities be sought for regional collaboration on some research areas.

3.1 Water Level Variation

The need for a detailed appraisal of water levels, was stated under 2.3.7. The effects that this might have on the return periods of extreme water levels and consequently on the defence standards analyses so far undertaken need to be assessed.

The first step would be to examine the

(i) requirements for monitoring,

(ii) monitoring methods,

(iii) data analysis and archiving, and

(iv) data validity/calibration.

on a SCOPAC wide basis. Alternatively the Coastal Group could undertake this task whilst considering the influence of gauges beyond the SMP boundary, which are very important in this area due to the relative lack of sufficient long-term records. The aim would be to develop a basis for consistent long term measurement. There would need to be liaison with POL and MAFF regarding their future plans for operating tide gauges and analysing data. The exact requirements for installation of new gauges, changes in data analysis techniques and archiving and validity of existing records would be established. Where identified, additional calibration should be undertaken to confirm long-term locations to ensure data quality.

The second step would be to undertake sea level analysis preferably on a SCOPAC wide basis again using the best new gauges as well as relating to key longer term records. As well as improving confidence in estimates of extreme sea levels, analysis could include trends in extreme sea levels which would link to flood risk.

In several years time, the Coastal Group should examine whether sufficient data records have built up to warrant an analysis of sea level rise trends. Estimates of sea level rise remain weak for the SMP area, however records of minimum 10 and preferably 20 years would be required. Establishing appropriate monitoring would ensure that this would then be possible in the future.

3.2 Wave Refraction Analysis

Wave prediction and refraction modelling are necessary in order to ascertain inshore wave conditions and their residual energy levels. Analysis and modelling has been undertaken as part of the SMP studies. These are important parameters in understanding processes such as littoral drift and erosion. The analysis should be extended to utilise a 10 to 15 year wave climate record and improve model grid site.

While bathymetric data exists for the areas all along the study coast, doubts about the quality of available water level data has limited efforts towards establishing inshore wave characteristics and energy information. With the feedback from the monitoring described in Section 2.2, the analyses described above can be more rigorously completed and updated in the future.

Existing and field data should be used to calibrate a model incorporating refraction, diffraction, breaking and friction that can provide reliable predictions of shoreline wave conditions based on input of offshore wave conditions from the Met Office wave model. Such a model could then be used to determine the conditions involved in the development of coastal problems in the SMP area, determine extreme wave conditions along the coast and form the basis of testing solutions.

3.3 Archaeology Review

Poole Harbour has been identified as an area where once dry land is now located in the intertidal or seabed environment. As a result it could potentially produce exceptional data about both artefacts and past environments. Hulks may lie unrecorded in the saltmarshes and rivers of the study area, and it is possible further finds will be discovered during development work in Poole Harbour. Dedicated underwater surveys would reveal more about the shipwreck sites and analysis of the more accessible wrecks, and geophysical surveys in submarine areas under threat could help identify sites and aid quantification of the resource. This would facilitate more accurate management proposals.

Field walking should be undertaken at regular intervals, or following high storms or floods, to assess erosion in archaeologically sensitive areas and record exposed finds. A review of the archaeological database should be undertaken prior to proposing construction in any area indicated as archaeologically sensitive. Identification of funds may prove difficult for such work.

The shorelines of the study coast as they are today are very different from those that existed in historic time. It has been established that archaeological investigation work such as that being carried out at Quarr, on the Isle of Wight, provides a good indication of change. Even though it provides only a coarse measure of what might be termed as the natural evolving trend of the coastline, before Man started to substantially impart his own influence, opportunities should be taken to carry out such investigations when they occur.

3.4 Improve Assessment of Current Defence Standards

Whilst this initial development of the SMP has undertaken an assessment of the standards of protection offered by existing coastal defences, confidence in the accuracy of the results is not always high due to the poor data which exists in respect of the foreshore. It should be recognised that beaches forming the foreshore are an integral part of the defence system, these are forming nature's

own defence. The exposure of man-made defences behind these is directly related to the height, condition and volatility of the foreshore. Fundamental to any accurate assessment of the standard of defence provided therefore is a knowledge of the current state of these beaches, in particular their level. It should however be recognised that beaches vary in level subject to short term or seasonal fluctuations.

Throughout this shoreline there is a considerable lack of contemporary information relating to foreshore levels, thus only half the information on defence of the shoreline is presently in existence. A priority recommendation for further study therefore is to undertake a level survey where defence structures are presently located and where beaches, dunes, marshes or shingle ridges provide the full defence in their own right. The opportunity should also be taken at the same time to check defence structure information where the SMP studies have indicated anomalies between database records and observation or anecdotal information.

Using this new information, the standards of protection provided by the present defences should be re-calculated. This will involve confirming the defence cross-sections, re-analysing wave breaking characteristics to take account of new foreshore data and computing performance against overflow, run-up and overtopping. All other information (such as waves and water levels) has been derived already as part of the SMP studies.

A further advantage of undertaking this work is that it will offer a comparison with that survey work which has taken place before and provide baseline against which future monitoring can be assessed, which will assist in continually improving the understanding of shoreline evolution.

3.5 Increase Understanding of Future Changes in Poole Bay

3.5.1 Quantification of sediment exchange between the open coast and Hook Sands.

Previous studies and the coastal processes modelling undertaken for this SMP have advanced knowledge of the sediment pathways near Poole Harbour entrance. However there remains great uncertainty over the actual rate of sediment movements and changes that are taking place to the coast as a result. The way in which changes to Hook Sands, a very dynamic feature, affect Poole Sandbanks and Studland Bay needs to be identified by a combination of fieldwork and modelling integrated with the findings and data from earlier work. Similarly the effect of Poole Harbour entrance training bank is not fully understood. Further understanding would help in management of Studland Bay, at Poole Sandbanks and also in the optimisation of future beach nourishment schemes in Poole Bay. Previous beach nourishment schemes have been limited to the Bournemouth BC frontage of Poole Bay. Future schemes could be initiated for the Poole Sandbanks to Southbourne frontage jointly by Borough of Poole and Bournemouth BC, in consultation with Poole Harbour Commissioners.

3.5.2 Poole Bay Beach Management Plan

Following on from 3.5.1, a Beach Management Plan (BMP) for Poole Bay would identify the requirements, mechanism and programme for beach management between Poole Sandbanks and Hengistbury Head, principally involving co-ordinated beach nourishment schemes. It would also link the Poole Bay monitoring and data storage needs to scheme needs.

3.5.3 Managed Retreat

To counteract future sea level rise, particularly within the harbours, areas for managed retreat need to be identified. These are detailed in the individual management units, for example near the Rivers Frome and Piddle, and at Keysworth Marsh. The scope for increasing the area of water inundation can only be identified by detailed investigation of existing defence levels, breach/modification implication and saltmarsh evolution. Trial sites should be established within Poole Harbour and monitored, to help establish local viability of policy for conservation objectives, for example habitat replacement requirements as likely to be demanded by the Habitats Directive.

3.5.4 Studland Bay Shoreline Evolution Study

Again following on from 3.5.1 and fieldwork such as regular beach profiling, the complex natural defence system within Studland Bay needs to be evaluated to understand change and future evolution.

Erosion in the southern half of the sandspit is threatening National Trust facilities. The rate of erosion has increased recently, raising the question of whether this will continue at recent rates or whether/when a more stable situation or lower erosion rate would be reached. The significance of changes and erosion at Shell Bay also need to be evaluated. The risk of a breach between the training bank and sandspit needs to be evaluated.

3.6 Increase Understanding of Future Changes in Christchurch Bay

3.6.1 Quantification of future evolution at Naish Farm

Between Highcliffe and Barton-on-Sea, the cliffs at Naish Farm continue to erode. The cliffs are designated an SSSI on account of the sequence geological exposures of the various Eocene clay beds which also have high fossil content.

These exposures are maintained by erosion. In the longer term, erosion will begin to threaten significant assets at both the Highcliffe and Barton ends of this length. It is also recognised that particular beds are of greater value than others and that because they dip inland, may in some cases have a limited remaining 'exposure' life.

The long term threat needs to be more fully evaluated at both ends by fieldwork/monitoring and geotechnical analysis. Also the geological conservation priorities need to be identified and combined with the quantification of erosion risk to property (and possible technical solutions) in order to agree the details of an appropriate and sustainable long term policy. An associated element could be to reduce erosion by placing shingle on the depleted beach. Wider implications of management actions also need to be considered including possible effects on littoral transport and the sediment budget.

It will be important to identify the timescale for any change from short-term to long-term policy.

3.6.2 Beach Management Plan for Christchurch Bay

Because of the potential knock-on effect of constructing coastal defence schemes within this bay, future schemes need to be linked to a clear understanding of how

the overall beach system is linked and how it changes with new coastal defence structures or nourishment schemes. A BMP would also evaluate all existing profile, grading, water level data and wave data within the Bay and how nourishment schemes within Poole Bay link/feed into Christchurch Bay. The BMP would also assist in ensuring co-ordinated future monitoring and data storage.

3.7 Sand Dune Management at Studland

3.7.1 Overview

Dunes are important features of many sandy coasts and are often inadequately appreciated and protected. They tend to form on stable coasts and will allow considerable volumes of sand, which are not required in the fronting beach, to be stored landward of the backshore. When storms occur, waves will cut into the dunes and the sand will enter the beach system to help resist wave attack. After the storm is over, sand will gradually be returned to the dune system as the area is restored to its former condition re-establishing the natural coastal defences.

In order to keep sand available to the beach system, it must be held in an accessible form. It is here that the frontal dunes and their vegetation are so important. The vegetation acts to trap sand that is held in reserve until storm events occur. Should this natural link be broken, then future erosion problems are likely to increase as the loss of sand from the 'system' or interference within the sediment cycle can create an imbalance causing the beach / dunes to retreat further during the next erosion event. The future of dune complexes within Poole and Christchurch Bays depends to a large extent upon whether they are self sustaining systems.

Of relevance here as well as for most sand dune systems in the south west of England, is that the pattern of sand dune locations around the shoreline is largely a legacy from the last glaciation which ended some 10,000 years ago (ie. material was transported onshore by winds and waves as sea levels rose). Should this offshore source of material not be apparent today or sources are too far away to be easily transported onshore by prevailing coastal processes, then any adverse impacts (natural or man induced) on the present dune system may correspond in a net sediment loss.

The management of the sand spit and dunes at Studland Bay are an important issue, and to a lesser extent the dunes at Mudeford Sandbank. Dunes have also recently been regenerated at Poole Sandbanks.

3.7.2 The Need for a Dune Management Strategy

Impacts on, and degradation of, areas of sand dune can arise from both natural causes and man induced interference. The main impacts are:

- Land claim

Land claim has been the major factor for loss of sand dune habitat along the open coast and estuaries in Britain. Development of chalets, beach huts or residential properties in dune systems creates unnecessary pressures on the natural and developed system and creates problems with regard to claims for future shoreline protection measures

- Sand Removal

The main protection needed for dunes is to prohibit any removal of sand. Either intentionally through sand mining or inadvertently through recreational practices, once a frontal dune is worn down by vehicles, foot traffic or by consequent loss of vegetation, dunes may be eroded by wind or wave action and will no longer serve their unique protective role.

- Sea level rise and coastal squeeze

In their natural state, sand dunes will respond to relative changes in sea level by migrating inland when sea levels rise and migrating seawards when sea levels fall. The presence of a sea wall or development within hindshore dune systems constrains the landward margin of the sand dune and thus prevents any natural readjustment to rises in sea level. In this situation, however, the seaward margin will migrate landward causing the width of the sand dune to be reduced, again reducing their standard of service in defence terms as foredune levels reduce.

- Grazing

Grazing by horses, sheep or rabbits has a range of impacts on sand dunes through modification of the species diversity and also physical damage by trampling. Once the fragile cover of vegetation is broken, sand can be blown away by strong winds resulting in small blow-outs.

- Recreation

The potential for serious damage to areas of sand dune through unrestricted coastal recreation practices is growing. Uncontrolled access has historically created problems in dune systems though with the introduction of various dune stabilisation techniques, areas of bare dune can be reduced. Dunes are greatly affected by human trampling and in areas of coastal recreation the vegetation can be badly damaged unless steps are taken to control access.

Whatever the cause of loss or degradation of an area of sand dune, the general consequences of these activities are:

- increase the instability of the dune face by preventing the establishment of dune colonising vegetation
- reduced integrity of the foredune through loss of stabilising dune vegetation and exposure;
- increased risk of blow outs and thus dune breaching;
- potential loss of habitat;
- potential loss of conservation value or biodiversity; and
- potential loss of amenity and recreation area.

Within this subcell area most dune stretches are starved, retreating and in need of careful management and maintenance in order to retain them as beneficial conservation areas and for their natural defence capability. The Sand Dune Management Strategy is at the forefront of this. The following are some of the techniques that can be adopted to either help to stabilise or retain sand dunes:

- introduce 'buffer zones' to prevent future development in the dunes;
- introduce re-vegetation programs;
- selection of appropriate hardy species and native beach grasses; and

- introduce a planned beach access path for pedestrians and vehicles.
- introduce sand fences

In identifying and evaluating solutions, it is essential that a holistic approach be adopted. In particular, solutions should be formulated that address not only the immediate priorities of the area and region but also the long term sustainability of these features as defences in the future.

3.7.3 Requirements for a Sand Dune Management Strategy

An effective Sand Dune Management Strategy must consist of a framework that allows the shoreline to be treated as a dynamic system. Beaches and foredunes erode and accrete in response to varying sediment supplies, sea level changes, storms and a range of more local scale processes. If a balance is to be achieved between shoreline protection and the conservation of dunes, a Sand Dune Management Strategy must understand and provide for some reasonable range of shoreline fluctuations. The overall requirements of a Sand Dune Management Strategy should seek to address the three key functions of sand dunes; nature conservation, recreation and sea defence. These functions need to be evaluated to ensure that all three are possible within specific areas and if so, attempt to formulate conflict resolution procedures between these functions. Commonly, the catalyst here is the maintenance of the natural character and natural values. How achievable these are will be subject to close review.

Clear implementation procedures for ensuring sustainable management of the dunes is required. This should not, however, be restricted to the needs of coastal defence. The Strategy should be broad, covering other issues such as coastal recreation and the requirements of nature conservation. Learning from dune management programmes worldwide, a series of appropriate guidelines should be promoted to encourage dune stabilisation to occur over the long term.

It is the capacity of the dune and fronting beach to store and supply material to the fronting foreshore and submerged nearshore that provides the system its ability to protect the shoreline. However, if the net input of material is less than that being taken away, the system as a whole is likely to be depleted over time. It is important that the frontal dunes remain 'fluid', alternately receiving and yielding sand. Consequently, the Sand Dune Management Strategy must acknowledge these interactions as well having a good understanding of sediment budgets operating in the area. There is thus a requirement to initiate studies on the coarse sediment potential in particular, so that appropriate future strategies can be implemented.

3.7.4 Implementation Co-ordination Requirements

To effectively co-ordinate implementation of the various components of the Sand Dune Management Strategy, a Steering Group consisting of key organisations and/or individuals should be formed. The Group should comprise representatives of the local authority and organisations with expertise or an interest in management of the sand dunes, in this instance National Trust. It is recommended that the Group be fronted by an organisation which takes responsibility for initiating the terms of reference for the different studies (field work, modelling, aerial photography) ensuring that all aspects are completed on budget and to an agreed programme schedule. The Group will be responsible for establishing the strategy

programme and overseeing implementation, with a key function being quality control to ensure research is carried out to the required standards.

The non-authority organisations likely to be involved include academic institutions, environmental bodies such as English Nature, County Wildlife Trusts, the Royal Society for the Protection of Birds, and relevant NERC organisations, particularly the Institute of Terrestrial Ecology (ITE).

3.8 Prioritising of Further Studies

Whilst all of the above studies are regarded as important for understanding the issues around this coast and ultimately the long term defence or otherwise of the shoreline, some guidance is required on the urgency for such work. The following list provides an indication of the relative need for the information that will result from these. This reflects in part the current defence situation, the land at risk and the rate of changes that are taking place. This does not however preclude the need for some of the specific studies also identified within the Management Unit Statements for individual areas.

PRIORITY	PROPOSED STUDY	AUTHORITIES
Highest priority	Water Level Variations	All / SCOPAC
	Defence Standards	All / SCOPAC
	Hook Sands Study	BoP/BBC/PDC/PHC
	Naish Farm Study	CBC/NFDC/EN
	Poole Bay BMP	BoP/BBC/PDC
	Christchurch Bay BMP	CBC/NFDC/BBC
Medium	Studland Bay Study	PDC/PHC
	Studland Sand Dunes	NTrust/PDC/DCC
Lowest Priority	Wave Refraction Analysis	All
	Archaeology Review	PDC/PHC/BoP/CBC

In addition, Future Monitoring would be High Priority.

Of the Highest Priority Studies, the Hook Sands Study, Poole Bay BMP and Christchurch Bay BMP need to proceed as soon as possible, to ensure effective strategic management of coastal defences needs. Reference Standards needs to be addressed promptly as well.

4 SALTMARSH AND MUDFLAT MANAGEMENT

4.1 Overview

Saltmarshes and mudflats are fragile and complex tidal environments formed from the accumulation of fine silts and sands in a relatively low energy environment, promoting colonisation by salt tolerant plants. The presence of vegetation encourages further sedimentation and so the saltmarsh develops both laterally and vertically. The main factors that control the development of saltmarshes are: sediment supply; tidal regime; wind-wave climate and changes in relative sea level. As a consequence, most saltmarshes occur in sheltered tidal environments where there was, at least historically, an adequate supply of sediment.

Similarly, the fronting mudflats are areas where there can be an equilibrium between the supply of sediment and the potential erosion created by waves and tidal currents. Important in the interaction is the affect of the biology in enhancing the cohesion of the sediment and reducing erosion. In this way the flora and fauna may be important in controlling the shape of the mudflats. Because of tidal variations, there are likely to be large differences in the timing and rates of biological processes on different mudflats.

Most of the estuaries in Britain are in areas bounded by low land which has in the past been reclaimed from the sea; typically this has been achieved through the gradual enclosure and draining of the saltmarshes. Thus, the majority of saltmarshes are backed by a flood defence embankment. As the enclosed marsh is drained the soils shrink and the land level is depressed, whilst on the seaward side of the embankment the continued process of accretion will cause the marsh to gradually increase in height. The net result of these processes is that much of the hinterland is at or often below sea level thus increasing the risk of flooding.

As a natural sea defence feature, saltmarshes provide a buffer to ongoing coastal processes such as wave and tidal energy and, against damaging storm events. Their ability to absorb wave and tide energy can result in the embankment, which often delineates the landward edge of the saltmarsh, being constructed to a lower specification than would have been required had the saltmarsh been absent. In addition, the weight of the marsh itself provides additional stability to the toe of the constructed defences.

Thus, saltmarshes can provide a significant benefit to the flood defences of an area, and the careful management of saltmarshes should be included as a >soft engineering= solution to the provision of long term, sustainable flood defence schemes. The presence of a healthy saltmarsh constitutes a natural sea defence asset.

As well as their important role in sea defence, saltmarshes and mudflats also have a significant environmental value, containing rare plants, and providing wildlife habitats and breeding and feeding areas for numerous birds. The majority of saltmarsh areas within Poole and Christchurch Harbours are designated as SSSI's, along with European level designations (SPA, Ramsar, SAC).

There are significant areas of saltmarsh and mudflat within Poole and Christchurch harbours with potential conflicts including recreation, marsh erosion, channel dredging etc, thus generating the need for a strategy. There are also internationally

important saltmarshes/brackish marshes behind Hurst Spit which may be dependant upon processes within this SMP area.

4.2 The Need for Saltmarsh and Mudflat Management

Impacts on, and degradation of, areas of saltmarsh and mudflat can arise from both natural and anthropogenic processes. The main impacts are:

- Land claim and embankment construction

Land claim has been the major factor for loss of saltmarsh and mudflat habitat in the majority of the estuaries in Britain and is a practice that dates from Roman times. The consequence of land claim is that it reduces the width of the intertidal area and hence reduces the ability of the remaining mudflats and marsh to dissipate wave energy. Also, as noted above, land claim can result in the hinterland being at a lower elevation than the foreshore. In addition, the presence of an embankment can provide a focus for wave energy at high tide and can create areas of erosion immediately adjacent to the structure. This will enable a pond to be created and the process will be self perpetuating often resulting in the development of a channel at the top of the marsh. This channel facilitates higher wave energies to be directed onto the defence structure, and also the loss of protective saltmarsh at the toe will affect the integrity of the structure itself.

- Sea level rise and coastal squeeze

In their natural state, saltmarshes and mudflats will respond to relative changes in sea level by migrating inland when sea levels rise and migrating seawards when sea levels fall. The presence of a sea wall or embankment constrains the landward and thus prevents any natural readjustment to rises in sea level. In this situation, however, the seaward margin will migrate landward causing the width of the saltmarsh and foreshore to be reduced, again reducing the buffering effect of the marsh.

- Dredging

Dredging of navigation channels is common on the edge of mudflats, due to the naturally high sedimentation levels. These activities may adversely affect the mudflats and adjacent saltmarsh, through changes in the channel morphology, potential erosion of the saltmarsh, increases in wave energy, or the dumping of dredged material.

- Pollution

Saltmarsh and mudflat habitats can be damaged by pollution, for example, agrochemical from land run off, or discharge of waste water effluents into coastal waters.

- Grazing

Grazing by cattle or sheep has a range of impacts on saltmarshes through modification of the species diversity and also physical damage by trampling. By contrast grazing by cattle is being used at Hengistbury Head as a positive management mechanism to reduce the encroachment of scrub species at the fringe of saltmarshes up against the higher and drier land mass.

- Recreation

With the rising popularity of jet skis and other water sports, the potential for serious damage to areas of saltmarsh is growing.

Whatever the cause of loss or degradation of an area of saltmarsh or mudflat the general consequences of these activities are:

- modifications to the hydraulic regime;
- more aggressive nearshore wave climate;
- increased wave and tidal energy on the embankment or sea wall;
- reduced integrity of the embankment or seawall though loss of toe protection and exposure of the toe;
- increased risk of tidal overtopping;
- increased risk of breaching ;
- loss of habitat;
- loss of conservation value or biodiversity;
- loss of amenity and recreation area; and
- damage to fisheries including spawning grounds and shell fisheries.

It is recognised that areas of saltmarsh require careful management if they are to be retained as beneficial conservation areas and for their natural defence capability. The following are some of the techniques that can be adopted to either help to retain or increase the area of marsh:

- brushwood polders and groyne;
- breakwaters;
- foreshore recharge;
- managed retreat.

In identifying and evaluating solutions it is essential that a strategic and holistic approach is adopted. Saltmarshes are the product of thousands of years of sedimentation and biological production often involving sources of suspended sediment and migrations of biological species from outside the SMP area. Thus, solutions should be formulated that address not only the immediate priorities of the area and region but also the long term sustainability of the defences and natural assets of the area.

4.3 Requirements for a Saltmarsh and Mudflat Management Strategy

Although saltmarshes and mudflats present a complex, yet relatively accessible environment, many fundamental questions remain incompletely answered. In the context of British examples, these include :

- What are the sources and amounts of fine sediment currently supplied to a particular saltmarsh/mudflat complex?
- Can geochemical and mineralogical characteristics be used to identify sediment transport trends and quantify sediment budgets?
- What is the relative importance of factors which control saltmarsh vegetation growth and why are certain species prone to periodic 'die back'? Can this be managed or controlled?
- Can monitoring of changes in marsh vegetation give an early warning of stress to the system induced by sea level rise or other environmental changes?

- What are the implications of increased marsh or mudflat erosion in polluted estuarine systems ?
- What effects will accelerated sea level rise and possible changes to coastal hydrodynamics have on marsh vegetation communities and their associated fauna ?
- What will be the physical and ecological effects of abandoning or repositioning existing defences ?
- Can models be developed to predict the likely response of existing marshes and mudflats to changes in relative sea level, contemporary coastal processes, and sediment supply over the next century ?

In order to attempt to answer these uncertainties, an appropriate management strategy for the area of the Poole and Christchurch Bays Shoreline Management Plan will require the following components:-

- Research aimed at assessing the long-term sustainability of the saltmarshes. This will involve a study of long-term and historical trends in the size, distribution and growth/erosion rates of saltmarsh and mudflats as part of evolution of the coastline. It will require a knowledge of the physical factors affecting geomorphological changes and sediment supply and demand. For example, surveys of 210(Pb) and 137 (Cs) to estimate accretion rates could assist in identifying whether marshes can keep up with future sea level rise

- Investigations, in the light of the above, of the optimal methods of surveying and monitoring change in the saltmarshes and intertidal flats. These should consider remote sensing methods (CASI aerial photography/LIDAR survey), monitoring frequency (1 - 5 yearly), optimum season for identifying community/ ground cover types, methods of classifying vegetation, etc.

- A ground survey relating saltmarsh plant communities to elevation, enabling generic and predictive models of plant community change to be applied to the coastal cell and used as a basis for management plans to sustain and create saltmarsh.

- Surveys identifying potential areas of saltmarsh habitat creation both by engineering techniques (breakwater, groynes, etc.) in the intertidal and by managed realignment of sea defences (the vertical elevation models produced from the above will be instructive here).

- Studies of methods for maintaining, enhancing and creating saltmarshes (desk study, but applied specifically to the range of options offered by the estuaries and coast under consideration), and the establishment of targets for the future sustainable use of saltmarsh.

- Ecological surveys to establish biodiversity 'hot spots' and the location of species of scientific or conservation interest in a regional and national context (again, much of this information is

available but needs to be brought together as a research annex to any SMP).

- Detailed assessment of the success of earlier schemes to delay or prevent saltmarsh dieback and review of the impact of various forms of management (including saltmarsh protection schemes) on saltmarshes.

- Development of a management plan at the scale of the entire coastal cell or linked to a regional one which fully collates the range of tidal and other physical forcing factors which impinge on the growth and development of saltmarsh (including what is known about changes in and factors affecting the morphology of intertidal mudflats).

A current research project into the morphological development of intertidal mudflats entitled INTRMUD is being coordinated by the University of Plymouth. The aims of this are to:

- Investigate the characteristics of a range of mudflats to establish a classification which illustrates the relative importances of tide range and phase, wave exposure, sediment physical and biological properties, and the biological community structure. This will propose a series of conceptual models of mudflat development.

- Carry out experiments on a number of type-mudflats to quantify the processes and their interactions, their ranges and timescales of variation.

- Formalise the relationship in statistical descriptions, and test their validity by computer modelling, using the field data.

- Provide a basis of understanding which can be used in environmental management.

This is very closely linked to the proposed components of the Poole and Christchurch Bays Saltmarsh and Mudflat Management Strategy, outlined above.

The INTRMUD project is considering estuaries throughout Europe, and its findings will assist in the development of the management strategy.

4.4 Strategy Implementation

4.4.1 Coordination Requirements

In order to effectively coordinate implementation of the various components of the Saltmarsh and Mudflat Strategy, a 'Steering Group' consisting key organisations and/or individuals should be formed. The group should consist representatives of local authorities and organisations with expertise or an interest in management of saltmarshes. It is recommended that the group be fronted by an organisation which takes responsibility for initiating the terms of reference for the different studies (field work, modelling, aerial photography) ensuring that all aspects are completed on budget and to an agreed programme schedule. The group will be responsible for establishing the strategy programme and overseeing

implementation, with a key function being quality control to ensure research is carried out to the required standards.

The non-authority organisations likely to be involved include academic institutions such as the Universities of Plymouth (Prof. Keith Dyer), Bournemouth, Southampton, Portsmouth and Royal Holloway College (RHC) (Ken Pye), environmental bodies such as English Nature, County Wildlife Trusts, the Royal Society for the Protection of Birds, and relevant NERC organisations, particularly the Institute of Terrestrial Ecology (ITE). Key individuals who would provide ideal technical guidance to the group include Prof. Alan Gray of ITE and Ken Pye of RHC, with their well documented experience in this area of study.

4.4.2 Resource Requirements

Implementation of the programme will involve tasks and therefore costs for each partner involved in the Steering Group. It is, therefore, recommended that the programme be pitched at no less a scale than the present geographical extent of the SCOPAC region. This would therefore allow the opportunity to incorporate an assessment of saltmarsh issues across a wider geographic area, with possibly far reaching implications for the UK and within Europe. Funding Agencies are likely to be more sympathetic to the objectives of the study if it reflects transnational issues which is the case here.

It is recommended that funding for this project be sought through the European Commission, particularly the EU LIFE Initiative which recently has provided funding for a number of Demonstration Programmes for Coastal Zone Management in the SCOPAC region. There are a number of EC measures in place of relevance to the protection and management of coastal zones in Europe. Advice on and details of these should be sought from either Robin McInnes of the Isle of Wight Council or Malcolm Turnbull of Dorset County Council, as both have recently been awarded European funding for coastal programmes. In summary, the key financing instruments available include:

- LIFE - of which the new draft regulations (Regulation COM (95) 135 final) includes a heading specific to the management of coastal zones
- TERRA - part of the programme of innovative actions of Article 10 of ERDF Regulation which are aiming at the support for the realisation of pilot projects concerning transnational zones.
- INTERREG II C - the EC initiative for transnational cooperation on issues of European spatial planning. To succeed in winning funding from this line, programmes will have to be submitted from national authorities, such as relevant NERC bodies (ie: Institute of Terrestrial Ecology).
- MAST III – the funding source for Plymouth University's INTRMUD mudflat research project.

Implementation of the programme will involve tasks and therefore costs for each partner involved in the Saltmarsh Strategy team. It is, therefore, recommended that the programme be pitched at no less a scale than the present geographical extent of the SCOPAC region. This would therefore allow the opportunity to incorporate an assessment of saltmarsh issues across a wider geographic area, with possibly far reaching implications for the UK and within Europe. Funding Agencies are likely

to be more sympathetic to the objectives of the study if it reflects transnational issues which is the case here.

It is anticipated that funding is required to cover studies and fieldwork over a minimum of two years. After carrying out field surveys and aerial reconnaissance work (minimum one year period), in association with cross analyses, a final stage of discussion and dissemination of results should be planned for the second year.

5 IMPLEMENTING THE PLAN

5.1 Adoption of the Plan

The Shoreline Management Plan recommends preferred strategic coastal defence options plus requirements for further studies and future monitoring. The next phase is for each of the individual operating authorities to adopt the plan as a basis for future management of the shoreline. This will involve consultation with all interested organisations.

5.2 Implementing the Strategy

Once the plan is adopted, the next procedure is the implementation of the strategies presented in the SMP. This will involve developing outline concepts for the nature of works to be undertaken, producing more detailed cost estimates for them and establishing a programme of both capital and maintenance works. This does not, however, preclude the development of understanding through the undertaking of monitoring or other studies.

Whilst this phase will generally be conducted separately by each Authority, it will be important to liaise on the implementation programme. This will help to avoid operations which may be to the detriment of others in the shorter term (eg stabilising beaches could have a short term downdrift impact until an equilibrium state is reached), optimise the use of resources, and increase awareness of other's operations. This could lead to overall benefits and result in lower cost defences in the future (eg combined beach nourishment schemes). Such strategic studies may therefore be best undertaken as a co-operative effort which does not stop at administrative boundaries, in a similar manner to the undertaking of this SMP.

Finally, it is important to recognise the need to conduct appropriate studies when developing the outline concepts beyond this stage, ensuring that the local processes are fully understood as well as the broader ones. The monitoring to be undertaken will be of great significance in enabling this.

5.3 Review and Updating of the Shoreline Management Plan

As stated previously, this SMP contains the defence strategy that will be implemented at the present time. However, this SMP is a 'live document' and must be capable of change. This concept will ensure that new information, such as that resulting from the additional studies or future monitoring described, as well as any future changes in planning policy or environmental needs can be incorporated into the SMP. The table at the end of this Part should be used to record all relevant new information which should be assessed in updates of the SMP.

These factors may necessitate a change in coastal defence strategy, however it would be inappropriate to have a continuous review and change to the strategy.

The approach therefore must be one by which the new information can be incorporated and the implications of this upon the present strategy assessed. This would be collated and a strategy review undertaken at specified intervals. A maximum time span of 5 years between such reviews is recommended. Notwithstanding this, the format of this SMP is such that if circumstances dictated, a review to enable a strategic change in defence policy could be implemented at any time.

The proposed time frame will allow the monitoring recommendations to be implemented and the further studies to be carried out prior to updating the SMP. As such studies are completed, it is recommended that this information is appended to, or referenced within the SMP.

Ultimately the responsibility for updating and reviewing the SMP lies with the Authorities involved, and close co-operation is necessary. It is important that new information is shared and that each Authority maintains an up to date SMP to avoid a number of different versions existing. This may be best achieved by nominating one Authority as a central co-ordinator with overall responsibility for maintaining the SMP, or appointing an independent party to fulfil this role.

Finally, there has been consultation throughout the development of this SMP to develop awareness and elicit reaction. This consultation should be continued and the SMP used as a vehicle to inform and facilitate public involvement in coastal defence issues in the future. The Coastal Group will need to consider the best means for involving the public activating their interest and obtaining comment, firstly during the SMP Consultation period and thereafter. Forms of communication are required that make the subject appealing to a wide audience without losing the essential scientific underpinning of the process.

NEW INFORMATION FOR FUTURE UPDATES

Management Unit	Information	Source

NEW INFORMATION FOR FUTURE UPDATES (contd)

Management Unit	Information	Source