Coastal Trends Report
North Norfolk (Old Hunstanton to Kelling)

RP005/N/2007
November 2007
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We operate at the place where environmental change has its greatest impact on people’s lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.
The North Norfolk coast
Coastal Trends Analysis

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1.1 **Purpose and application**

This report is intended as a tool to assist coastal managers in a variety of their functions including: strategic planning, capital engineering works and maintenance programmes. In addition to this the report will be of assistance with general education and awareness raising of coastal issues. The outputs also will also aid the determination of beach health parameters within NFCDD (National Flood and Coastal Defence Database).

1.2 **Background**

The Anglian coastline stretches from Grimsby near the mouth of the River Humber to Southend-on-Sea on the northern side of the outer Thames estuary (*figure 1*). With a total length of approximately 470km the coast is a diverse mixture of dune fronted flood plains, shingle barrier beaches, saltmarsh and soft cliffs. There are no significant geological ‘hard rock’ coastal areas and thus significant proportions of the coast are vulnerable to marine flooding and erosion. This is likely to be compounded by climatic change and sea level rise in the future. In order to reduce the impacts of this upon the built and natural coastal environment much investment has been made in both hard and soft engineering solutions over the last century. This has resulted in significant proportions of the coast being artificially held to prevent the loss of development and infrastructure located in vulnerable areas.

The Environment Agency has undertaken regular strategic coastal monitoring of the Anglian coast since 1991. The rational behind the programme is to assist the implementation of appropriate and sustainable works on the coast whether this be works undertaken by the Agency for the purpose of flood risk management or works undertaken by various maritime district council partners for erosion reduction purposes. An additional output from the monitoring programme is the assessment of coastal dynamics to inform long term strategic plans for the coastline. The vehicle for this is the Shoreline Management Plan (SMP) process, which is currently being reviewed along the entire Anglian coast.

The Anglian Coastal Monitoring programme collects a variety of data including:

- Annual aerial photographs
- Annual topographic beach surveys (winter and summer) at 1km intervals
- Bathymetric surveys (extension of beach survey lines out to approximately 10 metre depth offshore)
- Continuous wave and tide recording (nearshore and offshore)

In addition to this, in-depth monitoring addresses specific sea defence scheme requirements at a variety of locations along the coast. At the time of writing, the Anglian monitoring programme has begun phase VII, which includes a suite of five offshore, and twenty nearshore continuous wave and tide recorders.

Various reports based upon the data collected over the years have been produced. Until now the work undertaken has been unable to assess any significant trends in the data due to the insufficient length of time over which the data has been collected. However the Agency now possesses 15 years of beach topographic data and it is therefore possible to analyse these to determine initial indicators of longer-term
trends. Data collected in the future can be readily added to this analysis to further ascertain the validity of the trends.

1.3 **Beach topographic profile data**

The Environment Agency has collected beach topographic profile data at 1km intervals along the coast since 1991. Profiles are taken twice yearly in summer and in winter. The most recent set of available data means that there is now a continuous record of beach levels spanning fifteen years. Generally the area of interest is the average rate of beach erosion or accretion along the coast. In addition to this, gradual change to the gradient or steepness of the beach is of particular interest to coastal managers.

The analysis of trends in beach morphological behaviour may have significant impacts upon coastal management decisions in the future. Artificially defended beaches that are experiencing erosion and steepening trends may prove to be increasingly difficult and expensive to maintain. Even with maintenance, the structures may fail because of inadequate structural support or ground movements from diminishing quantities of beach material and subsequent beach platform loss. However it is not the intention of this report to ascertain such issues at a local scale. The ongoing revisions of the Shoreline Management Plans (SMP) and Coastal Strategic Studies, which are currently being compiled along the Anglian coast, are the appropriate vehicle for this assessment.

The length of the Anglian coast means that there are over 400 topographic profiles that have been collected over the years. For the purposes of regional strategic coastal management, the entire UK coast has been divided up sediment cells and sub-cells (HR Wallingford, 1994 & Defra, 2006). These are individual discrete sections of the coast that are considered to be independent from each other in terms of coastal processes. The relevant sections on the coast are:

- **Flamborough Head to Donna Nook** Sub-cell 2a+b
- **Donna Nook to Gibraltar Point** Sub-cell 2c
- **Gibraltar Point to Old Hunstanton** Sub-cell 2d
- **Old Hunstanton to Kelling** Sub-cell 3a
- **Kelling to Lowestoft Ness** Sub-cell 3b
- **Lowestoft Ness to Felixstowe** Sub-cell 3c
- **Harwich to Canvey Island** Sub-cell 3d

These boundaries are convenient divisions for the separation and publication of the results of the trends analysis reports.

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1 The first SMP review for this section of coast will encapsulate the coast from Flamborough Head to Gibraltar Point. Only that part of the coast south of the Humber is within the Anglian region.
1.4 Analysis methodology

The profile data presented in this report is in the form of beach level analysis. The data was analysed using a function of ‘SANDS’ software \(^1\). Tidal levels and conversions from Chart Datum to Ordnance Datum were kindly supplied by Proudman Oceanographic Laboratory from their ‘POLTIPS’ software \(^2\). Generally, the accepted definition of the foreshore is the intertidal region between the highest and lowest tide level. Here the area between the MHWS (Mean High Water Springs) and MLWS (Mean Low Water Springs) level is used\(^2\).

*Figure 2* demonstrates the principle of beach profile change over time along with changes to beach gradient. Along certain stretches of coast where seawalls or other structures constrain the landward movement of the coast, beach volumetric change may be of interest. This is particularly relevant where artificial beach nourishment is undertaken. In other areas, where long frontages are unconstrained by linear defences the, quantification of beach volumetric change is of less importance.

*Figure 2. Conceptual diagram of a beach profile showing shoreline advance/retreat and foreshore change parameter.*

*Figure 3* demonstrates how the analysis was performed and a trend is obtained. The example used in *figure 3* is from an eroding beach, which is retreating with an average trend of 3.86 m yr\(^{-1}\). However in any single year the actual erosion observed varies considerably. For example between 1996 and 2000 very little erosion occurred whereas between 2000 and 2001 the beach retreated by almost 20 m.

\(^2\) For some profiles where there are limited data at MLWS the data from MLWN (Mean Low Water Neaps) is utilised.
A important factor in coastal risk management policy decision making is foreshore steepening. A wide flat beach can dissipate incoming wave energy much more readily than a narrow steep beach. Using historical Ordnance Survey data, Taylor et al (2004) concluded that 61% of the coastline of England and Wales had steepened since the first OS County Series Survey published between 1843 and 1901. Of the remainder 33% had flattened and 6% experienced no rotational movement. Earlier work by Halcrow (1998) used the method to assess the Anglian coast to assist in the development of a management strategy for the Environment Agency’s coastal flood defence predecessor, Anglian Water. This study concluded that 78% of coast had experienced steepening between the mid 1800’s to the 1970’s. The analysis in this report uses a similar methodology to that of Taylor et al and although the length of time covered in this report is an order of magnitude less than their data-set, the data utilised here is likely to be of much greater accuracy. The positional accuracy quoted in Taylor et al for OS maps are +/-5m for pre-1945 County Series Maps and +/-3.5m for post-1945 National Grid mapping. Whereas the accuracy of the Anglian Coastal Monitoring profiles is +/-0.05m vertical and +/-0.02m horizontal.

Changes in the gradient of the beach between MHWS and MLWS are expressed in the form of the ‘foreshore change classification system’ (Halcrow, 1988) shown in table 1. Positive Foreshore Change Parameter (FCP) values indicate a beach system advancing seaward and negative values show a system retreating landward. The individual FCP numbers indicate either flattening, steepening or no rotation. As no pair of MHWS and MLWS trendlines were likely to possess exactly the same gradient, every profile could be described as either flattening or steepening. In order to eliminate insignificant rotational changes any change of less than 1.5% of the mean width of the foreshore was considered to be no change. In addition to this, judgement
was used where some apparent rotational changes were deemed to be unreliable due to high degrees of foreshore variability.

1.5 Future outputs

Future updates of this report will include updated information on beach trends using the latest available profile data. In addition to this, the report may include extended analysis utilising other data sets collected by the Shoreline Management Group. Bathymetric surveys have been undertaken at 5 year intervals and this will be enhanced as part of the phase VII (2006-2011) monitoring programme. In addition to this output from the wave and tide recording buoy deployments will be included. These reports will support and inform the move towards a ‘risk-based’ monitoring programme for 2011 and beyond.
Table 1. Foreshore change classification system adapted from Halcrow (1988)

<table>
<thead>
<tr>
<th>FCP</th>
<th>MHW</th>
<th>MLW</th>
<th>Inter-tidal (gradient)</th>
<th>Profile change</th>
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<tbody>
<tr>
<td>+ 6</td>
<td>Advance</td>
<td>Advance</td>
<td>Flattening</td>
<td></td>
</tr>
<tr>
<td>+ 5</td>
<td>Advance</td>
<td>Advance</td>
<td>No rotation</td>
<td></td>
</tr>
<tr>
<td>+ 4</td>
<td>Advance</td>
<td>Advance</td>
<td>Steepening</td>
<td></td>
</tr>
<tr>
<td>+ 3</td>
<td>Advance</td>
<td>No movement</td>
<td>Steepening</td>
<td></td>
</tr>
<tr>
<td>+ 2</td>
<td>Advance</td>
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</tr>
<tr>
<td>+ 1</td>
<td>No movement</td>
<td>Advance</td>
<td>Flattening</td>
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</tr>
<tr>
<td>0</td>
<td>No movement</td>
<td>No movement</td>
<td>No rotation</td>
<td></td>
</tr>
<tr>
<td>- 1</td>
<td>No movement</td>
<td>Retreat</td>
<td>Steepening</td>
<td></td>
</tr>
<tr>
<td>- 2</td>
<td>Retreat</td>
<td>Advance</td>
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<td>- 4</td>
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<td>- 5</td>
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<td>No rotation</td>
<td></td>
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<tr>
<td>- 6</td>
<td>Retreat</td>
<td>Retreat</td>
<td>Steepening</td>
<td></td>
</tr>
</tbody>
</table>
2.0 North Norfolk (sub-cell 3a) coastal trends

2.1 Introduction

The information presented here is the result of data collected along the North Norfolk coast from Old Hunstanton in The Wash to Kelling. This coast provides the only classic British example of a barrier beach (Royal Haskoning 2003). The system is comprised of a discontinuous series of sand and gravel barrier systems that front, and provide protection for extensive networks of marsh area, some of which have been reclaimed, along with a myriad of creeks and lagoons typical of this type of environment. The most significant barriers are Scolt Head Island and Blakeney Ridge. Seaward of MHWS there are extensive sandflat foreshores that, in places, extend 2.4 Km down to MLWS.

The entire length of coast benefits from the following designations:

- North Norfolk Coast SAC
- The Wash & North Norfolk Coast SAC
- North Norfolk Coast SPA
- North Norfolk Coast Ramsar site
- North Norfolk Coast SSSI

All of the above designations encompass the entire North Norfolk coast from Old Hunstanton to Kelling Hard, 1Km west of Weybourne. The designations cover the coastline up to the MHWS mark. In addition to this, the area is also designated as the North Norfolk Area of Outstanding Natural Beauty (AONB). The boundaries of the AONB extend from the mouth of the River Great Ouse in The Wash to Winterton, a few Km’s north of Great Yarmouth.

Whilst large swathes of the British coastline have been in economic decline over recent decades, the North Norfolk coast has become increasingly popular with visitors preferring the unspoiled natural wilderness of this area. Visitors include walkers, naturalists, birdwatchers, horse riders and dog walkers. The area is very popular with sailors and a number of sailing clubs can be found along the coast.

The are relatively few classic ‘hard’ coastal defences in this area such as seawalls, groynes or revetments when compared to other sub-cells along the Anglian coast. In places, property, farmland and fresh marshes are offered some protection from exceptional tide levels by raised earth embankments that have, in places, been reinforced. However, these tend to be subtle and often form the track of the popular North Norfolk coastal path. An exception to this is the privately funded short length of steel sheetpiling and rock armourstone adjacent the Royal West Norfolk Golf Club near Brancaster. To the west of this site a 400m length of gabion revetment, in poor condition, was breached in 2002 to provide enhanced flood defence and environmental benefits through the creation of 7.5Ha of saltmarsh habitat. This was one of the first ‘managed realignment’ schemes to be implemented in the UK.

This study deals only with the coastline and does not analyse any data that has been collected further inland. The Environment Agency has collected a total of 46 beach profiles along the North Norfolk coast approximately 1 km apart since 1991.
2.2 General description – North Norfolk

Figures 10 and 11 show the general results of the analysis, which are summarised in table 2 below. Appendix 1 shows the names and general locations of the profiles.

<table>
<thead>
<tr>
<th>General Trend</th>
<th>No.</th>
<th>Percentage</th>
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</thead>
<tbody>
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<td>28</td>
</tr>
<tr>
<td>No Change (+/- 0.2m yr)</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>Erosion</td>
<td>23</td>
<td>50</td>
</tr>
<tr>
<td>Foreshore Gradient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flattening</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Steepening</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>No rotation or movement</td>
<td>31</td>
<td>68</td>
</tr>
<tr>
<td>Defences at profile location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure*</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Beach management</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>No structures</td>
<td>38</td>
<td>83</td>
</tr>
</tbody>
</table>

Table 2 - general results of analysis

2.3 Outline observations

Of the 46 topographic beach profiles along the north Norfolk Coast, 50% have shown some erosional trend of the foreshore over the last 15 years. Only 17% have shown any significant steepening trend with the majority of profiles showing no rotation or movement. A significant feature of this coast is the broad expanses of sandflats meaning that, in some places, the foreshore can extend several kilometres seaward from MHWS. At these locations rotational changes in the order of several tens of metres are regarded as insignificant although erosion/accretion trends of the foreshore is presented.

As very few sections of this coast are artificially held by structures thus the beaches have been able to behave naturally (to a significant degree), and where applicable “roll back”, in response to the forces shaping the coast.

The following section offers description of the results of the analysis as well as graphically showing the trends overlaid over a suite of aerial photographs that were taken during summer 2006. Unless stated otherwise all trends and rates expressed relate to changes on the foreshore i.e. on or between the MHWS and the MLWS levels.

The descriptions are divided into six sections (figure 5) which broadly relate to the divisions concluded by Halcrow (1988) and Cambers (1975). The following offers a synopsis of their findings. Figures for longshore wave energy are taken from Halcrow (1988).

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3 This includes profiles that demonstrate no rotational change and no movement. In addition to this some profiles have a foreshore width of several 1000m (max 2400m) and therefore minor rotational foreshore change in the order of 10’s of metres is not regarded as significant.

4 This figure relates to actual structures at the location of the profile.
2.3.1 Old Hunstanton to Gore Point

N1D4, Old Hunstanton. A wide 750m foreshore with modest accretion rates of ~1m yr$^{-1}$. MSL shows a steady accretion of ~5m yr$^{-1}$. FCP (Foreshore Change Parameter) not applicable due to wide foreshore.

N1D5, Holme-next-the-Sea. Variable upper beach with a general trend of accretion. Lower beach shows stability with more modest accretion. No significant rotational change.

N1D6, west of Gore Point. Accretion of the upper beach at HAT and MHWS. MSL shows retreat with no data below this. Some foreshore steepening apparent.

Summary

The area is dominated by Chalk and Carstone cliffs that are undergoing erosion fronted by wide sand and shingle beach. Annual longshore wave energy of 0-500 kN s$^{-1}$, increasing towards Gore Point to 1000-1500 kN s$^{-1}$. Upper beach southerly littoral transport with lower foreshore northerly tidal.

Between 1992 and 2006 all (3) profiles have show some trend of foreshore accretion along this section.

2.3.2 Brancaster Bay

N1D7, Gore Point. Modest erosion of MHW and MLW marks with strong erosion at MSL. No significant foreshore steepening due to wide foreshore.
**N1C1.** Wide foreshore with significant erosion at MHWS and MLWN. No significant foreshore steepening.

**N1C2, Thornham Harbour Channel.** MLWS erosion rate of ~2m yr\(^{-1}\) with a variable MHWS. No significant foreshore rotational change due to wide foreshore.

**N1C3, East Sands.** Stable profile showing modest accretion at all levels.

**N1C4, Titchwell Nature reserve.** Erosion of upper beach of ~0.9m yr\(^{-1}\) with stability at MSL and MLWS. Slight flattening profile.

**N1C5.** Stable upper beach with significant accretion of ~6.5m yr\(^{-1}\) at MLWS giving a flattening profile.

**N1C6, Royal West Norfolk Golf Club clubhouse.** Clubhouse currently protected by armourstone therefore no change at MHWS. Highly variable MLWN position with an erosion trend of ~ 3.2m yr\(^{-1}\).

**N1C7, Royal West Norfolk Golf Club ranges.** Profiles show a relatively stable upper and lower beach with significant recession of ~15m yr\(^{-1}\) at MSL. Comparison of the 1992 and 2006 aerial photographs show some dune vegetation loss (*figure 6*) at this location, however there has been significant dune accretion 100-150m east of this location (see *figure 7*).

**Summary**

An area of dunes and beach ridges in front of both claimed marshland and natural saltmarsh. Annual longshore wave energy 1000-1500 kN s\(^{-1}\).

The profiles west of Thornham Harbour channel all show a significant erosional trend. To the east the coast tends to be more stable with some retreat of the lower beach at the eastern end adjacent to the golf club.
Figure 6 – Dune loss adjacent to eastern end of Royal West Norfolk Golf Club ranges
Figure 7- Morphological changes adjacent to eastern end of Royal West Norfolk Golf Club ranges
2.3.3  *Scolt Head Island*

**N1B1.** Although this profile shows a negligible mean trend there has been significant accretion at the MHWS level (~3.5m yr\(^{-1}\)) and erosion at MSL and MLWS (1.7 and 1.9m yr\(^{-1}\) respectfully). This is consistent with the westward migration of the western extremity of the island. *Figure 8* shows the extent of this from analysis of the 1992 and 2006 aerial photography.

![Figure 8 - westward migration of eastern Scolt Head Island](image)
N1B2, N1B3 and N1B4. These profiles all show erosion of the upper beach at MHWS. The first two of these show greater erosion at MLWS giving a beach steepening trend.

N1B5 and N1B6A. Profiles show low mean trends although both show erosion at MHWS of ~0.7 m yr\(^{-1}\). N1B5 data shows accretion at MLWS however this is unreliable due to few individual profiles reaching this point.

Summary

The best example of a barrier island on the British coast (Steers, 1981). Annual longshore wave energy 500-1000 kN s\(^{-1}\).

Of the six profiles on the seaward side of Scolt Head Island three are showing an erosion trend. These are located in the central part of the island. The only profile showing an accretionary trend is the most westerly profile, N1B1, which is consistent with the westward migration of the island. The remaining two profiles at the eastern end of the island both show stability over the monitoring period.

2.3.4 Gun Hill to Wells-next-the-Sea

N1A1, Gun Hill. Profile data shows a strong erosion trend of ~3.5m yr\(^{-1}\) at MHWS. Both MSL and MLWN show a similar strong trend.

N1A2. The mean trend at this location is low although the MHWS shows an erosion trend of ~3m yr\(^{-1}\). Accretion at MLWS of ~5m yr\(^{-1}\) gives a flattening profile.

N1A3. N1A3 shows an erosion trend of ~1m yr\(^{-1}\) at MHWS. MSL shows a strong accretion trend although this is unreliable as recent recession places the current MSL position in approximately the same position as in 1991. MLWS shows general stability throughout the monitoring period.

N1A4, western Holkham Meals. MHWS shows a strong accretion trend of ~7.6m yr\(^{-1}\). Both MSL and MLWS show an erosion trend of ~1.5m yr\(^{-1}\), giving a steepening profile.

N1A5, Holkham Gap. Both the MSL and the MLWS data shows a modest but steady erosion trend of ~2m yr\(^{-1}\). The MHWS data shows an erosion trend although this level shows high variability and thus the trend rate is unreliable. Currently the position of MHWS is ~90m seaward of the 1991 position. There appears to be a regular rapid seaward increase in MHWS position and subsequent recession, which appears to be the result of sandbars migrating onshore.

N1A6 and N1A7, eastern Holkham Meals. Both these profiles show a strong erosion trend. The profiles show high variability on the lower beach with steady erosion trends at the upper beach above MSL. No significant foreshore steepening.
**N1A8, Wells Lifeboat Station.** A 170m gabion revetment with timber piled apron protects the backshore dune ridge at this location. For this reason the upper sections of this profile show no change. The MSL and MLWS trends are generally accreting.

**Summary**

Area generally known as Holkham Bay. The backshore is dominated by an extensive line of dunes known as the ‘Holkham Meals’. Large sections of these dunes have been forested with pine trees over the last 150 years. Annual longshore wave energy 500-1000 kN s⁻¹.

Much of this section of coast shows an erosional trend with the strongest trends at Gun Hill and Wells beach. Much of Holkham beach shows erosion with no significant steepening. Advance at Wells lifeboat is principally at the lower beach levels beyond the main channel into Wells harbour. The large width of the foreshore along this frontage generally renders beach steepening values insignificant.

### 2.3.4 Wells-next-the Sea to Blakeney

The profiles at this location contain large sections of saltmarsh located on the landward side of the ‘beach’. In addition to the beach level analysis undertaken elsewhere in this report, the marsh has been analysed for trends of vertical change over the monitoring period. From the topographic profiles, vertical height was recorded every 20m and at each interval the data was analysed to obtain a trend. The results are shown in [Plan 9](#) and [Plan 10](#). Here lines are shown at 20m intervals along each profile and the length of these lines represents the trend. Red lines indicate a downward or erosional trend and green lines indicate a upward accretional trend.

**N2D1.** Profile shows modest accretion trends at all levels although, the position of the various levels is episodic with periods of rapid accretion returning to a common level. This appears to have occurred four times in the 15 years of monitoring.

**N2D2 and N2D3.** Beach levels at these profiles show strong erosion trends at MHWS and MLWS. The foreshore at this location is approximately 1.8-2.4Km wide therefore the beach cannot be described a significantly steepening.

**N2D4, N2D5 and N2D6.** These profiles show relatively little change over the monitoring period. There appears to be some recession of the MLWS level with advance of the MSL, however, as the overall foreshore is very wide it cannot be described as significantly steepening.

**Summary**

A large number of small bars of sand, shingle and shells and an unusual, recurved cuspate beach. Annual longshore wave energy 500-1000 kN s⁻¹.

Beach profiles show mixed results. The most westerly profile, N1D1, adjacent to lodge marsh, shows an accretionary trend particularly at the MHWS level. The central section, N2D2 and N2D3, show erosion of the lower beach around MSL and MLWS. The remainder show general stability.
With the saltmarsh analysis it should be noted that generally the rates of change in the
data are in the order of several mm per year and therefore relatively minor. Where
larger rates are shown this often coincides with vertical changes in and around the
marsh drainage channels.

2.3.5 Blakeney Point towards Sheringham

N2C1, Blakeney Point. Upper beach shows strong accretion trend of 4.6m yr⁻¹. Lower
beach levels, MSL and below, show high variability and hence no reliable
trends.

N2C2. Profile shows severe beach erosion and steepening. MHWS is retreating at
2.2m yr⁻¹, while MLWN is retreating at 15m yr⁻¹. Erosion consistent with the
migration of the Point towards the west.

N2C3. Although not as severe as N2C2, this profile shows a similar trend consistent
with the westwards migration of the Point. No significant retreat at MHWS but
erosion of lower beach and beach steepening.

N2C4 to N2C8, Cley-next-the-Sea. All profiles show steady retreat at all beach
levels at rates between 0.5 and 1.5m yr⁻¹.

N2B1, N2B2 and N2B3, Salthouse. The profiles show high variability of beach
levels. This is likely to be attributable to shingle recycling activities that have been
undertaken along the ridge up to 2006.

N2B4 and N2B5, Kelling Quag. Although data shows a large degree of annual
variability both profiles show a steady modest erosion rate with no significant beach
steepening.

N2B6, west of Weybourne car park. Generally a stable profile with little overall
beach loss between 1991 and 2006. However between 1995 and 2000 there was a
significant amount of beach loss and retreat at all levels. Levels have since recovered
and appear to be steady at similar levels to 1991.

Summary

This is an excellent example of a recurved spit formed mainly of a single shingle
ridge over 9Km in length. Generally, but not exclusively, the inland boundary is
marked by a low buff (an earlier now degraded cliffline) or land-claim embankments.

The westerly migration of the Blakeney Point system can be seen with the accretion
of N2C1 and the erosion and steepening of the profiles immediately to the east. A
comparison between the 1992 and 2006 aerial photography can be seen in figure 9.
The remainder of the profiles along this coast as far as N2C8 at the western end of
Salthouse marshes all show steady erosion with the marked absence of steepening.
The remainder of the profiles show mixed results with modest stability, accretion or
erosion and no trend of steepening. Although much of this section of coast has been subjected to mechanical beach recycling and reprofiling over the length of the monitoring period up to its cessation in 2006.

Figure 9 – Blakeney Point 1992 and 2006
Figure 10 – Mean erosion or accretion trends for western North Norfolk
Figure 11 – Mean erosion or accretion trends for eastern North Norfolk
3.0 Graphical View of Results

Legend to maps
Saltmarsh Change Rate (m/yr)
Red = erosion
Green = accretion

Anglian Coastal Monitoring Programme 2007 - North Norfolk
Plan 10 - Morston & Blakeney

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### Appendix 1 – Detailed Results

<table>
<thead>
<tr>
<th>Number</th>
<th>Approximate location</th>
<th>Metres per year</th>
<th>Mean rate</th>
<th>Notes</th>
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<tbody>
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<td></td>
<td></td>
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Appendix 2 - References

(1) SANDS software by Halcrow Group PLC. http://www.halcrow.com/sands

(2) POLTIPS software by Proudman Oceanographic Laboratory. http://www.pol.ac.uk/appl/poltipsw.html


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