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## Report Log

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Executive Summary

The shingle beaches provide a vital element of the flood and coastal erosion defences along the Dymchurch, and Romney Sands frontage (Management Unit 11 and 12 respectively). Without the protection of the shingle beaches many areas of this coastline would be subject to increased wave action and consequently, the risk of overtopping would significantly increase. The monitoring, analysis and feedback of the performance of the beaches is therefore crucial for the successful and sustainable delivery of flood and coastal erosion protection.

The condition and performance of individual beach sections are currently monitored through the Strategic Regional Coastal Monitoring Programme. This report evaluates changes along the coastline over the 2007-2008 period, and compares these to baseline surveys conducted since the outset of the project in 2003. The key findings are listed below.

Management Unit 11

- The frontage is currently exhibiting an overall erosive tendency, with a reduction in beach volume by 51,656m³ between 2007-2008.

- This process of erosion has been most dominant in the western section of this management unit and particularly at the toe of the beach in shore parallel bands. This has consequently resulted in a lowering of beach profiles for this western region.

- The analysis of beach profile data has indicated a reduced rate of crestline erosion that experienced in 2007. Although this indicates some degree of crestline stabilisation since the 2007 Summer Beach Management Survey, the profile cross sections clearly represent a reduced standard to those outlined by the 2003 scheme.

- When considering the overall changes since the start of the programme in 2003, it is now evident that the losses sustained over the past year have resulted in beach volumes returning to levels prior to 2003, when the beach recharge was undertaken.

- The combined effect of volume loss and beach level lowering has resulted in current levels being far below design standards. With long-term analysis projecting further accretion for this section it is evident that consideration should be given to the future provision of coastal protection and the improvement of current standards.

Management Unit 12

- Overall, MU12 has continued to display a significant accretional trend, with a 94,916m³ increase in beach volume between 2007 – 2008.

- Accretion dominant beach processes in MU12 are highlighted by the marked advancement of the peninsula. In the current reporting period crest widths have
increased by up to 10m in the western regions, and when considering the entire project timescale, crest lines have advanced up to 60m seaward of their 2003 positions.

- The advancement of crestlines has also resulted in increasing crest heights with western profiles indicating gains of 0.5 - 1m.

- Although the peninsula has shown substantial accretion in the current period, there has also been some degree of erosion recorded in the peripheral sections of MU12. The far western and eastern regions have recorded losses in the current year, with the western extremity actually experiencing the greatest loss since 2003.

- These losses, however, are overshadowed by the accretion of the peninsula, and overall result in little change to the standard of protection provided by the frontage.

- When analysing the overall changes experienced since the project began, it can be seen that MU12 has seen a significant increase in beach volume, with the addition of 386,105m$^3$ since 2003. Therefore, with the continual increase in beach volume and the advancement of crest line, the level of protection provided by the beaches will increase.

It is important to recognise the inconsistency in short-term trends. As with many coastal areas a lot of annual variability is expected, thus drawing conclusions with increased confidence will become possible as more data is collected, with regards annual losses, net sediment drift and erosion/accretion trends in section sub-units.
1 Introduction

Boundaries for the extent of this report are consistent with the Beachy Head to South Foreland Shoreline Management Plan 2 (2006), comprising Management Units 11 & 12. These largely cover the Dymchurch and Romney Sands frontage managed by the Environment Agency, where Hold the Line policy options are utilised in order to protect the rail/road infrastructure and settlements.

As part of the Strategic Regional Coastal Monitoring Project, the beach has been surveyed three times a year since the summer of 2003 using land based GPS techniques. These comprise biannual profile surveys (Spring and Autumn), and a complete Beach Plan Survey during the summer, full details of which can be found in the explanatory notes (Annex A). In addition, bathymetric surveys of the adjacent seabed were conducted in 2003/2004 & 2005/2006, and a network of tide and wave gauges has been established in the southeast region to provide data on the hydrographic conditions.

This report covers the changes in beach topography between the 2007 summer Beach Management Plan (BMP) survey and the most recent 2008 survey. A previous report (AR31: 2007) covers the observed changes from the 2003 baseline survey up until the 2007 summer survey. In addition, this contains a lot of background information, design levels and site-specific information. Please note that due to changes in management unit boundaries and reporting sections, previous reports may disclose different volumetric values and as a result no direct comparison should be made beyond information presented within this document.

1.1 Unit MU11

Management Unit 11 (MU11) is situated on the south Kent coast and extends from Littlestone-on-Sea to Dymchurch Redoubt. The 9km long beach consists predominantly of shingle to the southwest of Dymchurch, and sand to the northeast. Currently, coastal protection is provided by a combination of mobile beach and hard structures to ensure the low-lying Romney and Walland marshes are safeguarded from flooding. The preferred policy of the Shoreline Management Plan for the frontage is ‘Hold the Line’, given the value of the protected infrastructure and conservation areas. Notably, the beach fronting Littlestone-on-Sea town centre and golf course is designated as a SSSI (Site of Special Scientific Interest), highlighting the importance of continual beach monitoring along this frontage.

The frontage is divided by timber groynes at 50-200m spacing throughout almost all of its length, with the exception of a terminal rock groyne situated at St. Mary’s Bay. By the summer of 2003, a beach replenishment programme had imported more than 250,000m³ of shingle between Littlestone-on-Sea and St. Mary’s Bay (Jacobs Babtie, 2005), resulting in a relatively high beach level compared with further northeast. A large rock revetment is currently under construction from Willop Basin to the eastern boundary of MU11, to upgrade the ageing sea defences here. No other beach recycling/replenishment or engineering works are believed to have been carried out along the frontage since the Regional Coastal Monitoring Programme began in the spring of 2003.
The location of the frontage is shown in Figure 1.1, and also includes the nearest wave buoy and tide gauges.

1.2 Unit MU12

Management Unit 12 (MU12) is situated on the south Kent coast and extends from Dungeness Power Station to Littlestone-on-Sea. The 8.5km long beach consists predominantly of a shingle beach face that becomes increasingly steep towards Dungeness, and gently sloping sand and mud foreshore that is most extensive at Romney Sands. Vegetated shingle and sand dunes form the backshore in the north of the unit, with shingle further south. The open beach acts as the only coastal defence along the frontage, though a few of the numerous groynes at Littlestone overlap into this management unit. Notably, sections of the beach fronting Lydd-on-Sea and Dungeness are designated as SSSI (Sites of Special Scientific Interest), SNCI (Sites of Nature Conservation Interest), National Nature Reserves, RAMSAR and SAC (Special Areas of Conservation), highlighting the importance of continual beach monitoring along this frontage.

The current accretional tendency of this frontage allows accumulated shingle to be utilised on surrounding coastlines. Although the preferred policy of the Shoreline Management Plan for the frontage is ‘do nothing’, British Energy undertake annual recycling to balance the accretion-dominant eastern face of the Dungeness peninsula and the erosion-dominant south face in front of the power station. Recycled beach material from the east of Dungeness is also deposited throughout MU14 (Lydd Ranges) by the Environment Agency. However, the removal of shingle the borrow pit at Dungeness ceased in March 2007, with the EA now utilising an inland quarry run by Bretts to supply the MU14 frontage with material. This therefore regularly provides this section of coastline with fresh material changing the balance of local sediment dynamics. No other major beach recycling/replenishment or engineering works are believed to have been carried out along the frontage since the Regional Coastal Monitoring Programme began in the spring of 2003.

The location of the frontage is shown in Figure 1.1 and also includes the nearest wave buoy and tide gauges.
Figure 1.1: Site Location and Wave/Tide Gauge
2.0 Surveys

All topographic and bathymetric surveys are referenced to a Global Positioning System (GPS) control grid, established for this programme, and conducted according to the current Environment Agency’s National Specification, summarised in the Explanatory Notes (Annex A). The schedule of completed surveys since the start of the Regional Monitoring Programme is given in Table 2.1.

2.1 Topographic

The schedule of completed surveys since the start of the Regional Monitoring Programme is given in Table 2.1.

Digital Ground Models of the 2008 Beach Management Plan topographic survey are shown in Plates 3.1 and 3.2 (Annex B) superimposed upon the ortho-rectified aerial photograph of 2006. The method used for deriving Digital Ground Models is given in the Explanatory Notes (Annex A).

Table 2.1: Schedule of Topographic Surveys

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2.2 Bathymetric
The schedule of surveys since the start of the Regional Monitoring Programme is given in Table 2.2.

Table 2.2: Schedule of Bathymetric Surveys

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<td>07/07/2006</td>
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<td>1000m</td>
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3.0 Analysis

3.1 Difference Models

Now that the 2008 BMP data set has been compiled, it is possible to overlay the results of the survey with data from the previous year (June 2007). This enables comparative volumetric analysis to be undertaken to determine change over a given period. Through the use of three dimensional ground models and ortho-rectified aerial photography it is possible to create a visual interpretation of the volumetric change that has occurred during each analysis period. This is shown in Plate 3.3 (1-10) for MU11 and Plate 3.4 (1-11) for MU12, which indicates areas of net erosion or accretion (N.B. a 0.25m difference in elevation is considered as “no change”) and the location of any extraction/deposition sites.

Negative values represent erosion that has occurred during 2007/08 and positive values indicate accretion. Whilst these figures show an overall change in beach volume within each discrete section, it should be recognised that the data is based on the BMP survey, which is undertaken once each year. It is therefore only a snapshot of one moment in time, and the particular dynamics of each frontage need to be taken into account. This ensures that the information shown in the difference models represents the net change rather than capturing a particular extreme variation caused by a large event.

The following section of the report contains a narrative summarising the changes that have taken place over the past year. As part of this exercise, a hypothesis of the processes driving these changes has been created. This has been carried out for a number of locations along the frontage, with the extent and nature of the change generally depicting the boundaries of each location. In addition, the beach profiles have been cross referenced with the other profile surveys carried out on an annual basis in order to ensure that the results from the difference models are representative of net profile change. This then gives an indication of the beach variability over three time steps in each individual year.

Whilst these figures show an overall change in beach volume within each discrete ‘area change boundary’ it should be recognised that the data is based on the beach management survey, which is undertaken once each year. It is therefore only a snapshot in time and the particular dynamics of each frontage need to be considered. This will ensure that the information shown in the difference models represents the net change rather than capturing a particular extreme variation caused by a large event.

3.2 Profile Evolution

While beach plan surveys provide a more accurate view of morphological change and beach volume levels, profiles still provide a visually more discernable impression of the beach cross section. Also, to ensure that the results from the difference models are representative of net change rather than a particular event that may have been captured by the survey, the beach profiles have been cross referenced with the other profile surveys carried out each year. This then gives an indication of the beach variability over three time steps in each individual year.
The Cross-Sectional Area (CSA) has been calculated for all beach profiles. This is calculated as the area of profile above a Master Profile (MP). In general, the lower boundary of the MP is the transition between the beach material and the foreshore. The landward boundary is either the seawall or, where a hard structure is not present, the landward extent of the stable part of the beach. The Master Profile is held constant for a given profile line and therefore the changes in CSA through time can be derived.

3.3 Management Unit 11

In strategic appraisal and management terms, the frontage had originally been divided into 45 inter-groyne sub-sections that reflect locations of major beach structures. However, with the revetment works being undertaken to the east of this section it has now been determined that the standard of protection will no longer be sediment dependant for the newly revetted section. Consequently all current topographical surveying procedures and analysis will be discontinued for this section. This effectively reduces the reporting section to 7km which will then be sub-divided into 26 subsections.

To aid purposeful analysis the unit has been split into 3 large sections as depicted in Figure 3.1 overleaf. These reflect changes in beach configuration and/or the presence of terminal structures. In the context of this report, beach change will be described in these 3 large sections; Section 1 ‘MU11SW’ extends from sub-sections 1-8, Section 2 ‘MU11SMB’ from 9-20 and Section 3 ‘MU11DYM’ from 21-26.

The remainder of this chapter contains the digitised difference models and a narrative summarising the changes that have taken place over the last year, and hypotheses of the processes driving these changes.
Figure 3.1: MU11 Beach analysis sections
3.3.1 Section 1 - MU11SW

Section 1 represents the most southerly stretch of beach, extending from the Varne Boat Club to the St Mary’s outfall. This section has continued to demonstrate an erosional tendency for the fourth consecutive year, although it experienced the greatest loss in 2007 – 2008. Over the current reporting period, Section 1 has exhibited a 26,593m$^3$ loss of material, with only one subsection out of eight showing an overall gain in sediment between 2007 and 2008.

The areas of erosion have mainly been restricted to the toe of the beach, in shore parallel bands that coincided with the appearance of soft silty deposits during the 2008 BMP surveys. Although this soft strata is of a level similar to the previous year’s results, the semi-fluid nature of the sediment means it would be inappropriate to consider this material an effective replacement material.

Nevertheless, despite the erosion occurring in this section, the crest area for much of Section 1 has seen a slight stabilisation of sediment levels, contrasting with the retreating crest-lines exhibited over the previous year. These changes are picked up in Figure 3.2, which illustrates a typical beach profile and the various changes in formation since the project began. It also provides an insight into how the beach is performing post scheme.

It can be seen that the continuation of erosional processes since 2004 is clearly represented in the profile formation. Not only has there been a steady decrease in mid-slope material but the crest width has also retreated significantly. This has therefore resulted in the beach profile rapidly approaching a similar condition to that of 2003 for the replenished area of this section. It can therefore be concluded that without the presence of beach recycling or effective groyne structures, section one will continue to erode and retreat.
1) Beach profile 2003 pre-scheme

2) Beach profile 2004 post-scheme recharge

3) Profile shows successive retreat, most noted between 2005 and 2006

4) Profile now approximately 1.5m lower than design standard with a 7m reduction in crest width.

Figure 3.2: Profile changes along 4c00554.
3.3.2 Section 2 - MU11SMB

Section 2 covers the region east of the St Marys’ outfall to the start of the Martello car park in Dymchurch. This section is generally characterised by a gentle sandy foreshore with occasional shingle deposits covering the stepped revetment immediately east of the outfall.

In the current reporting period, Section 2 has experienced a net loss in material of approximately 10,000m$^3$, with all sub-sections recording a loss between 2007 -2008. This trend of erosion is represented in an evenly distributed loss of material throughout the section, with all sub-sections showing a similar amount of erosion. This suggests that material loss is relatively independent of groyne bay condition as the difference models show no evidential loss in the lea of groynes as expected.

The current trend consequently represents a direct reversal of the previous reporting period’s net gain, and across the entire project, a negligible change. Figure 3.3 below illustrates the relatively unchanged nature of the beach for a typical section two profile.

3.3.3 Section 3 - MU11DYM

Section 3 is the final section of MU11, and covers the remaining area between the Martello car park and the new rock revetment at Redoubt. During the current reporting period, Section 3 has experienced a net sediment loss with the erosion of approximately 15,000m$^3$ between 2007-2008. This erosion has primarily been confined to shore parallel bands in the mid foreshore level.

The only area of accretion observed in the 2007-2008 period is located updrift of the Dymchurch slipway and represents a very limited degree of material accumulation.
3.3.4 Summary Data
Table 3.1 provides a summary of volume change within each section during the period between the 2007 and 2008 summer surveys.

Table 3.1: Management Unit 11 - Summary of Erosion/Accretion Totals

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<th>Section Number</th>
<th>Error Estimate*</th>
<th>Erosion/Accretion (2006 to 2007)</th>
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<tr>
<td>1</td>
<td>+/- 8,410 m³</td>
<td>-26,593 m³</td>
</tr>
<tr>
<td>2</td>
<td>+/- 3,696 m³</td>
<td>-10,459 m³</td>
</tr>
<tr>
<td>3</td>
<td>+/- 3,529 m³</td>
<td>-14,604 m³</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-51,656 m³</td>
</tr>
</tbody>
</table>

* Error estimates are calculated as the survey area multiplied by a +/- 30mm error margin, although unlikely the error of combined surveys can be up to double this figure

3.4 Management Unit 12
To aid purposeful analysis, the unit has been split into 7 sections as depicted in Figure 3.4. These reflect changes in beach configuration and/or the presence of terminal structures.

The remainder of this chapter contains a narrative summarising the changes that have taken place over the last year, and hypotheses of the processes driving these changes.
3.4.1 Section 1  

Located immediately east of Dungeness Power station, Section 1 represents the western boundary of Management Unit 12. From the data obtained from the 2008 BMP survey, it is evident that this section has continued to be dominated by erosion processes, and as such has exhibited a net sediment loss of approximately 26,000m³ between 2007 and 2008. This continued pattern of erosion has resulted in approximately 80% of the section experiencing sediment loss.

The erosion experienced within this section has occurred throughout the entire active face, with the back beach sections continuing to display negligible change. Figure 3.5 illustrates the current beach profile of Profile 4c00764. From this it is evident that the current erosional trend has resulted in a reduction in crest width by approximately 10m since summer 2007.

The rate of erosion has increased significantly over previous years, with current rates 300% greater than those experienced in 2006 - 2007. This continued pattern of erosion reinforces the opinion that the combination of coastline alignment and predominant wave direction continues to prohibit the accumulation of shingle along this section. This opinion is further supported when considering the sediment losses that have occurred in front of Dungeness Power Station during the present reporting period (-13,000m³), and removes the possibility of the frontage being starved of sediment. It can therefore be postulated that due to the exposed nature of this section and the acute direction of wave approach, the probability of natural accretion along this section remains unlikely.

However, it must be acknowledged that when considering the entire project timescale to date (2003-2008), Section 1 has experienced negligible change with a net gain of approximately 16,500m³ over 5 years, most of which can be attributed to beach...
management practices. It is therefore important that monitoring continues to take place throughout this section, as although overall this section has shown little change, the past 4 years trend indicates that future sediment budgets will continue to decrease. Careful monitoring and data analysis will ensure that beach levels remain consistent.

3.4.2 Section 2

Section 2 has seen a continued trend of extensive accretion during the current period, with the entire section showing a build up of sediment across the active beach face. This has resulted in a net sediment gain between 2007 and 2008 of approximately 46,000m³. This trend not only demonstrates a striking contrast to the area in the west (Section 1), but also clearly defines the point at which coastal alignment influences the sediment transportation rate.

From this data it is evident that due to a predominant south-westerly wave direction, the change in alignment causes a reduction in transportation rates resulting in the accumulation of material. This area is then far more sheltered from the stronger south-westerly storm waves, which aids in the retention of material during the higher magnitude events.

Figure 3.6 illustrates how the current trend of accretion has altered a typical beach profile within Section 2. It is evident that the accumulation of sediment has affected the beach profile cross-section in two distinct ways. Firstly, the profile has advanced approximately 10m seaward. Secondly, the crest height of the beach has risen by 0.5 - 1m. The combination of these two factors has therefore resulted in a significant improvement to the current standard of protection provided by this mobile beach.

Figure 3.6: Profile 4c00752
3.4.3 Section 3

Section 3 has remained consistently the most accretive section for this frontage. During the current reporting period, Section 3 has experienced another significant increase in sediment with the net addition of approximately 49,000m$^3$ of material.

When considering the spatial distribution of accretion, this section continues to exhibit an intermittent pattern with distinct patches of erosion and accretion occurring side by side. This has resulted in differing profile changes across the frontage with the advancement and retreat of crestlines.

With this section experiencing some of the biggest sediment increases since the start of the project, it became apparent that the region created to assess the volumetric change was no longer adequate. It was therefore necessary to alter this region to encompass more of the advancing peninsula, which is indicative of the rate of advancement experienced (Figure 3.7).

![BMP 2007](image1) ![BMP 2008](image2)

Figure 3.7: Representation of changes to region inspection area.

It is also important to assess how this increase in material is reflected in the profile cross-section. Figure 3.8 represents Profile 4c00740, located in the centre of this area of accretion. It is evident that the localised accretion in this region during the current reporting period has resulted in an overall advance of the crest line by approximately 10m. When this level is compared to that identified in 2003 at the onset of this project, it can be seen that overall this section of frontage has migrated up to 60m seaward of its original location.

This change is representative of a hugely dynamic system that is heavily dependant on a continual supply of sediment. It is the feed of material from the west that is the overriding factor that enables this section to continue to advance.

Using evidence from wave theory, it is suggested that the accretion of material along this section is principally due to the refraction and shoaling of the higher magnitude south westerly waves as they approach this section of changed alignment. As these
waves approach the peninsula, the changing alignment causes a reduction in wave velocity, which in turn prohibits the suspension of material. This results in the wave front slowing and depositing material. It can however be suggested that as the peninsula continues to advance it will also become more exposed and as a result should theoretically reach a state of equilibrium providing consistent wave conditions persist.
3.4.4 Section 4 [Gain 17,823m$^3$]
Section 4 has again continued to accrete and during the present reporting period has achieved a net volume gain of 17,823m$^3$. The continuation of accretional trends illustrates a relatively stable beach with sediment building up across the active face. Figure 3.9 demonstrates the continuing growth of this section at Profile 4c00710. It can be seen that the rate of beach profile advancement has remained relatively constant since the project began and projects a continuation of accretional processes.

3.4.5 Section 5 [Gain 8,354m$^3$]
Section 5 has experienced a limited amount of accretion during the current reporting period. This accretion has occurred in irregular discrete patches often at crest level, which provides limited information on the processes driving these changes. However, what can be distinguished from the data is that again the back beach area has remained unchanged, and consequently illustrates the stable nature of this section and the good standard of protection it provides.

3.4.6 Section 6 [Loss 226m$^3$]
For the third consecutive year, Section 6 has shown limited change in sediment volume. During the current reporting period this section has seen a negligible decrease in volume by approximately 200m$^3$. This, however, gives a slightly skewed view of the actual changes exhibited throughout the entire section. From the 2008 BMS data it is evident that for the majority of Sections 6, material has accumulated at the toe of the dune system, thus supporting local opinion that the dune system is continuing to grow. This opinion is also supported by an investigation Shepway District Council is currently undertaking to identify dune encroachment on the properties to the rear.

The trend of accretion has been offset by the larger patch of erosion that occurred to the east, in front of the Varne Boat Club. Here the beach has eroded both at crest and foreshore level, and the degree of erosion has resulted in the data demonstrating a negligible change across the entire frontage.

It can be concluded that although both erosional and accretional processes have taken place during the current reporting period, the overall change should not affect the overall level of protection provided by this frontage.

3.4.7 Section 7 [Loss 229m$^3$]
Section 7 comprises the smallest reporting section for this management unit, and covers the area east of the Varne Boat Club slipway. Overall this section has shown negligible change during the current reporting period. The difference models clearly illustrate the erosion of the shingle bank in the lea of the slipway, which would be expected with the predominant south-westerly wave direction.
3.4.8 Summary Data
Table 3.2 provides a summary of volume change within each during the period between the 2007 and 2008 summer surveys.

Table 3.2: Management Unit 12 - Summary of Erosion/Accretion Totals

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Error Estimate*</th>
<th>Erosion/Accretion (2006 to 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+/-.3,694 m$^3$</td>
<td>-25,938 m$^3$</td>
</tr>
<tr>
<td>2</td>
<td>+/-2,811 m$^3$</td>
<td>46,121 m$^3$</td>
</tr>
<tr>
<td>3</td>
<td>+/-.8,053 m$^3$</td>
<td>49,011 m$^3$</td>
</tr>
<tr>
<td>4</td>
<td>+/-.7,297 m$^3$</td>
<td>17,823 m$^3$</td>
</tr>
<tr>
<td>5</td>
<td>+/-.6,956 m$^3$</td>
<td>8,354 m$^3$</td>
</tr>
<tr>
<td>6</td>
<td>+/-.4,547 m$^3$</td>
<td>-226 m$^3$</td>
</tr>
<tr>
<td>7</td>
<td>+/-0.796 m$^3$</td>
<td>-229 m$^3$</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>94,916 m$^3$</td>
</tr>
</tbody>
</table>

* Error estimates are calculated as the survey area multiplied by a +/- 30mm error margin, although unlikely the error of combined surveys can be up to double this figure
3.5 Long Term Summary

The following section provides a narrative considering the long term changes identified during the course of the Strategic Monitoring Programme for Management Units 11 and 12.

3.5.1 Management Unit 11

When considering the long-term evolution of MU11, it is evident that this management unit reflects a very dynamic and changing coastline. The overall impression gained from the data suggests that erosional processes dominate the coastline. Table 3.3 illustrates a summary of beach volume change since the commencement of the programme for the three reporting sections highlighted in this report.

### Table 3.3: MU11 Beach Volume Change Summary (2003 - 2008)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64,453</td>
<td>-20,096</td>
<td>-18,045</td>
<td>-892</td>
<td>-26,593</td>
<td>-1,173</td>
</tr>
<tr>
<td>2</td>
<td>-3,351</td>
<td>16,046</td>
<td>-21,798</td>
<td>12,384</td>
<td>-10,459</td>
<td>-7,178</td>
</tr>
<tr>
<td>3</td>
<td>-11,153</td>
<td>22,562</td>
<td>-20,965</td>
<td>19,367</td>
<td>-14,604</td>
<td>-4,793</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>49,949</strong></td>
<td><strong>18,512</strong></td>
<td><strong>-60,808</strong></td>
<td><strong>30,859</strong></td>
<td><strong>-51,656</strong></td>
<td><strong>-13,144</strong></td>
</tr>
</tbody>
</table>

During the current reporting period, MU11 has experienced a net loss of approximately 52,000 m$^3$ of beach material, with losses occurring in each section. When examining the distribution of beach change, it can be seen that Section 1 has experienced a higher level of change than Sections 2 and 3 combined. However, this is representative of the different type of beach material located within each section, i.e. a shingle beach being far more mobile than a sandy beach, and consequently is to be expected. Nevertheless, when considering long-term changes, it is evident that Section 1 largely experiences a greater degree of erosion when compared to Sections 2 and 3;

- **Section 1;** The continual erosion of this section has now cancelled out the recharge undertaken in 2003, projecting a long-term deficit over the next few years.
- **Sections 2 & 3;** Both sections have illustrated a similar pattern and rate of change since the project began. The data currently displays an alternating pattern of erosion / accretion and over the project timescale suggest that these sections are in ‘dynamic equilibrium’.

In conclusion, the loss of material in the present reporting period combined with the 2003-2007 period has now resulted in an overall loss in beach volume since the programme began. It can therefore be considered that although the initial recharge in 2003 has been crucial in maintaining beach levels, the lack of controlling structures or subsequent recharge has resulted in the net littoral movement of material out of this management unit.
3.5.2 Management Unit 12

The long-term trends of sediment distribution within MU12 appear to reflect a much simpler trend to that in MU11. When considering the volume changes highlighted in Table 3.4, it is evident that the frontage has consistently demonstrated an accretional tendency over consecutive years.

Table 3.4: Beach Volume Change Summary (2003 - 2008)

<table>
<thead>
<tr>
<th>Section</th>
<th>Volume Change (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-6,322</td>
</tr>
<tr>
<td>2</td>
<td>-17,736</td>
</tr>
<tr>
<td>3</td>
<td>41,102</td>
</tr>
<tr>
<td>4</td>
<td>10,808</td>
</tr>
<tr>
<td>5</td>
<td>6,177</td>
</tr>
<tr>
<td>6</td>
<td>271</td>
</tr>
<tr>
<td>7</td>
<td>983</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35,283</strong></td>
</tr>
</tbody>
</table>

The data clearly shows that overall this management unit has accreted by approximately 386,000m³ since the project began. Although the data shows a varying rate of accretion year-on-year, the overall trend seems to suggest that rates will remain relatively high for the next few years. This projection however is heavily dependant on the volume of mobile sediment available to the west. It can therefore be suggested that if current replenishment activities were to cease along frontages to the west (e.g. MU15), then the amount of sediment entering MU12 would significantly decrease. The consequential effects may therefore result in a reduced rate of accretion in forthcoming years.

Figure 3.10: MU12 Section Beach Volume Change
It is important to examine how these changes have been reflected in each individual section and the overall contribution they have made to the standard of protection provided by the frontage. Figure 3.10 charts how each section in MU12 has performed since the project began.

When considering the performance of each section over the whole of the monitoring project, it can be seen that the section demonstrating the greatest change is Section 3. This section exhibits the characteristics of an advancing coastline, and the cumulative results of consecutive accretional phases highlight the huge sediment resource stored here.

It is also evident that the borrow pit for the recharge schemes west of MU12 was influential in reducing the available sediment during the earlier years of the project. Section 2 clearly shows a loss in sediment during the first 3 years of the project, which coincides with the sediment extraction undertaken from the borrow pit. As of 2007, extraction from the borrow pit ceased, and subsequently sediment volumes have begun to recover.

Finally, it can also be seen that Sections 5, 6 and 7 have shown limited change during the entire project timescale. As a result, there is a stable, continued standard of protection provided by these section with limited human action required.
4.0 Wave Climate

Wave records are recorded by a Datawell directional wave rider buoy off Folkestone, first deployed on 08 July 2003.

This reporting year saw an increase in both the number and magnitude of storms and included the highest wave conditions experienced since the Waverider buoy was first deployed in 2003. In common with previous years, storms are concentrated around the winter and early spring months.

A detailed analysis of the wave climate for July 2007 to June 2008 is given in Annex C.

Figure 4.1: Example of wave statistics for 10th March 2008 storm (Highest event during reporting period)
5.0 Storm events

This reporting year saw in increase in both the number and magnitude of storms and included the highest wave conditions experienced since the Waverider buoy was first deployed in 2003. During this reporting period there were five storm events that exceeded the storm threshold of \( H_s = 2.5 \text{m} \) (Figure 5.1).

![Figure 5.1: Monthly time series of \( H_s \) at Folkestone](image)

- **Blue Line** – Significant wave Height (\( H_s \))
- **Red Line** – Storm Threshold (2.5m)
- **Green Line** – Post Storm Survey

The first storm event occurred in the morning of the evening of 18th November 2007 and out of the subsequent storms achieved the highest \( H_s \) of 3.58m, the highest significant wave height recorded since the buoy was deployed in 2003. The storm conditions for most events were generated due to a southerly wind direction with the exception of one that was south-easterly. Several positive and negative storm surges accompanied the storm events over this reporting period.
6.0 Performance Overview

6.1 Management Unit 11
Design profiles and crisis beach levels in Section MU11SW are reported by Jacob Babtie (2005). When considering all 2007-2008 profile levels, the current levels of the beach are well below the design standards, and in most cases now below or approaching crisis levels. The extensive erosion experienced within the current reporting period will undoubtedly result in a reduce standard of protection provided by the beach and in turn reduce the frontages capacity to withstand storm condition.

![Graph](image)

**Figure 6.1: Profile 4c00554**

Figure 6.1 illustrates this using Profile 4c00554. Although this isn't consistent along the whole frontage of MU11, in the areas where it does occur it appears to be around the same level as the 2007 beach levels, suggesting that this may be a more natural profile for the beach. However, it should be noted that a capital scheme is scheduled to be carried out at Dymchurch over the next couple of years, which should address this problem.

6.1 Management Unit 12
At present, the SRCMP has no details of design standards for the beach in MU12. Although this report illustrates the accretion-dominant beach changes seen over the past few years, these increases cannot be compared to any particular standard. However, it is hoped that over the next few years, alarm and crisis beach levels will be developed for all management units covered by the SRCMP.
7.0 Conclusion

7.1 Management Unit 11
As a whole, the MU11 frontage has eroded by 51,656m\(^3\) in the current reporting period, which is in direct contrast to 2006-2007 where the unit accreted by 30,859m\(^3\). Again in contrast to 2006-2007, it is now clear that the replenishment scheme completed in 2003 is no longer influencing sediment trends along this frontage and as a result has eroded by 13,144m\(^3\) since the project began. This indicates that when considering the management unit as a whole, the beach levels are now generally below those exhibited in 2003. It should, however, be acknowledged this has not occurred at a uniform rate across the frontage, and subsequently disproportionate levels can be found throughout MU11.

The western section of this management unit has experienced the greatest degree of sediment loss over the past year. This however is to be expected with the sediment type located in the west having greater mobility to the sand deposits located in the east. It also continues to be evident from the survey data that the current groyne field located along much of this frontage has no significant effect on the longshore migration of material, and subsequently material has deposited parallel to the seawall in discrete bands.

Nonetheless, it should be noted that a capital scheme is scheduled to be carried out in MU11 over the next couple of years, which should address the erosional trend in this management unit.

7.2 Management Unit 12
As a whole, the MU12 frontage has accreted by 94,916m\(^3\) between 2007 and 2008. The net gain in material represents a significant increase in sediment, which has been distributed in relatively localised sections on the Dungeness peninsula, with approximately 80% of the accretion occurring in Sections 2 & 3. With the bulk accretion concentrated within these sections, crest widths have consequentially increased, resulting in a net advancement of the peninsula by up to 10m between 2007 and 2008.

Taking into account the erosional trends in the peripheral sections of MU12 over the current reporting period, MU12 remains a dynamic frontage with no uniform sediment trend. This highlights the importance of continued monitoring to ensure long-term trends are recognised.

7.3 Final Remarks
The data recorded over this reporting period and summarised in this report exhibit a variety of trends. One of the more significant issues of storm performance is still be analysed, as without the data acquired from post storm surveys it is impossible to comment on the ability of the beach to withstand adverse conditions. Active involvement should therefore be taken to ensure that post storm surveys are requested, especially for the renourished area of Management Unit 11.

It is important to recognise the changeability of short-term trends. As with many coastal areas, much annual variability is expected, thus drawing conclusions with increased confidence will become possible as more data is collected. At this stage, it seems likely
that the general trends seen between 2007-2008 will continue, though not necessarily at the same rate.

Scheduled future monitoring includes profile surveys in the autumn of 2008. Storm surveys may be carried out if any event is deemed to have significantly affected the frontage. An interim report will be issued during the coming months, with the next Beach Management Plan report scheduled for issue after completion of the Summer 2009 Beach Management Plan survey.

All historic monitoring data is available at www.channelcoast.org, and future surveys will be obtainable after satisfying the projects quality assurance procedures.
Profile Location Diagrams