South East Strategic Regional Coastal Monitoring Programme

BEACH MANAGEMENT PLAN REPORT

Hythe Ranges

2012

BMP 161
March 2013

SOUTH EAST COASTAL GROUP
MANAGING THE SHORELINE

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Abstract

The shingle beaches provide a vital element of the flood and coastal erosion defences along the Survey Unit 4cSU10 (Hythe Ranges) frontage. Without the protection of the shingle beach in front of the flood embankment the risk of it being overtopped or breached during a storm is significantly increased. The monitoring, analysis and feedback of the performance of the beaches is therefore vital in ensuring the level of risk is maintained at an acceptably low level.

The condition and performance of each of the 44 groyned bays along the 3km frontage is currently monitored through the Strategic Regional Coastal Monitoring Programme. This report evaluates changes along the coastline in the previous years and compares these to baseline surveys conducted at the outset of the project in 2003. The key findings are listed below:

The data recorded over this reporting period and summarised in this report shows that since 2003 this frontage has remained relatively stable. The sediment change over the entire project timescale equates to a net loss of approximately -11,990m^3 and indicates that the frontage is relatively stable when considering the timeframe involved.

When analysing the sediment change during 2011-2012 it is apparent there has been a net loss of approximately 12,500m^3 with a significant component of this loss, -7,718m^3, occurring in section 5. The performance of individual bays remains relatively dynamic and irregular with some bays experiencing negligible losses and others, significant gains. It is therefore important to continue to monitor this survey unit to identify whether the present changes represent short term fluctuations or longer term sediment trends.

The Dymchurch coast protection scheme has now been completed with the construction of a new rock revetment to protect the sea wall and improvements to the existing promenade. With these newly installed structures the likelihood of any beach material entering this frontage from the west is very low, leading to the assumption that in order to maintain sediment along this frontage, the maintenance of the groyne field will be pivotal in sustaining the current standard of defence.

It is important to recognise the potential 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 regard to annual losses, net sediment drift and erosion/accretion trends in section sub-units.

Scheduled future monitoring includes profile surveys in Autumn 2012 and Spring 2013, and in addition post-storm surveys may be carried out if any event is deemed to have significantly affected the frontage. An interim report will be issued on completion of the spring profile survey, with the next BMP report scheduled to be issued after completion of the Summer 2013 beach plan survey. All historic monitoring data is accessible online (www.channelcoast.org), and future surveys will be available after satisfying quality assurance procedures.

1.0 Introduction

Boundaries for the extent of this report are consistent with the Beachy Head to South Foreland Shoreline Management Plan (2006), comprising of Survey Unit (4cSU10). A 'Hold the Line' policy option is adopted for this unit in order to protect the Ministry of Defence (MoD) installation, road infrastructure and settlements. 4cSU10 covers the frontage from Fisherman's' beach (West Hythe) to Redoubt (Dymchurch) and is currently managed by the MoD.

Under the recommended survey specification created by the strategic regional coastal monitoring project, the beach would normally have been surveyed three times a year since the summer of 2003 with land based GPS techniques. This schedule comprises of biannual profile surveys and a complete beach plan survey every year, full details of which can be found in the explanatory notes (Annex A). In addition to this, bathymetric surveys are undertaken and analysed using the network of tide and wave gauges which have been set up in the southeast region.

4cSU10 has only been regularly surveyed since the beginning of Phase 2 of the monitoring project, in 2007. As a result, the data available prior to 2007 is limited compared to adjacent Survey Units. However, with a full programme of surveys planned for the future, it will be possible to formulate firmer conclusions and trends as the project progresses. This report covers the changes in beach topography between the 2011 Beach Management Plan (BMP) survey and the most recent 2012 BMP survey.

1.1 Coastal Processes & Management

The shingle plateau at Hythe Ranges is used as a military training range. The area is protected by a revetment of rock armour stone and long term erosion has created a shallow embayment within which timber groynes have been used with some success to stabilise the shoreline. The western end of the frontage is further embayed and is therefore more stable than the eastern end.

The Hythe Ranges frontage has a series of shingle ridges marking the development of the relic shingle ridge that once ran continuously from Cliff End, in East Sussex, to Hythe. In more recent times the Hythe Ranges frontage has been retreating, as can be seen by the large set back in the shoreline position north of Dymchurch Redoubt, where the position of the shoreline has been fixed by substantial sea defence structures for many decades.

The predominant wave direction in this area is from the southwest and although the Dungeness peninsular does provide some protection from waves from this direction, the effects of refraction and diffraction result in some of this energy propagating into the Hythe Bay. The offshore bathymetry is relatively uniform and the contours are roughly parallel to the shoreline, which faces south east. This has a refractional effect on the waves as they propagate inshore and by the time they reach the beach, the south westerly waves are generally travelling in a south-southeast direction.

Between the low-lying shingle area of the Hythe Ranges and the sea there is a shingle ridge that is protected by a rock armour revetment, which extends from Dymchurch Redoubt to the west end of Fisherman's Beach. The sandy lower foreshore is narrow and flat but the shingle upper foreshore is steep and extensively groyned. The rock revetment extends the full length of the frontage and is constructed from a wide range of rock gradings. In some locations the size of rock armour used is in excess of 6 tonnes and in others it more resembles rip-rap with pieces as small as 10kg.

In general the shingle beach provides much needed protection to the rock armour revetment along this frontage and where beach levels are low, extensive revetment repairs have had to be made. These repairs have been carried out over a period of time and on a reactive basis with the addition of rock to any part of the revetment showing signs of collapse or considered at risk of breaching.

The flood and coastal defences of the Hythe Ranges are part of a continual line of defence that extends from Camber Sands to Folkestone and provides protection to the vast area of low-lying land of the Dungeness foreland. In order to ensure that the maximum benefit is delivered from the existing defences it is necessary to monitor the behaviour of the beach and to use this data to inform any decisions that need to be made with respect to its management. The integrity of the revetted embankment relies heavily on the protection provided by the shingle beach and through this continual monitoring process a greater understanding of its dynamics can be gained.

The location of the frontage is shown in Figure 1 and also includes the nearest wave buoy and tide gauge.

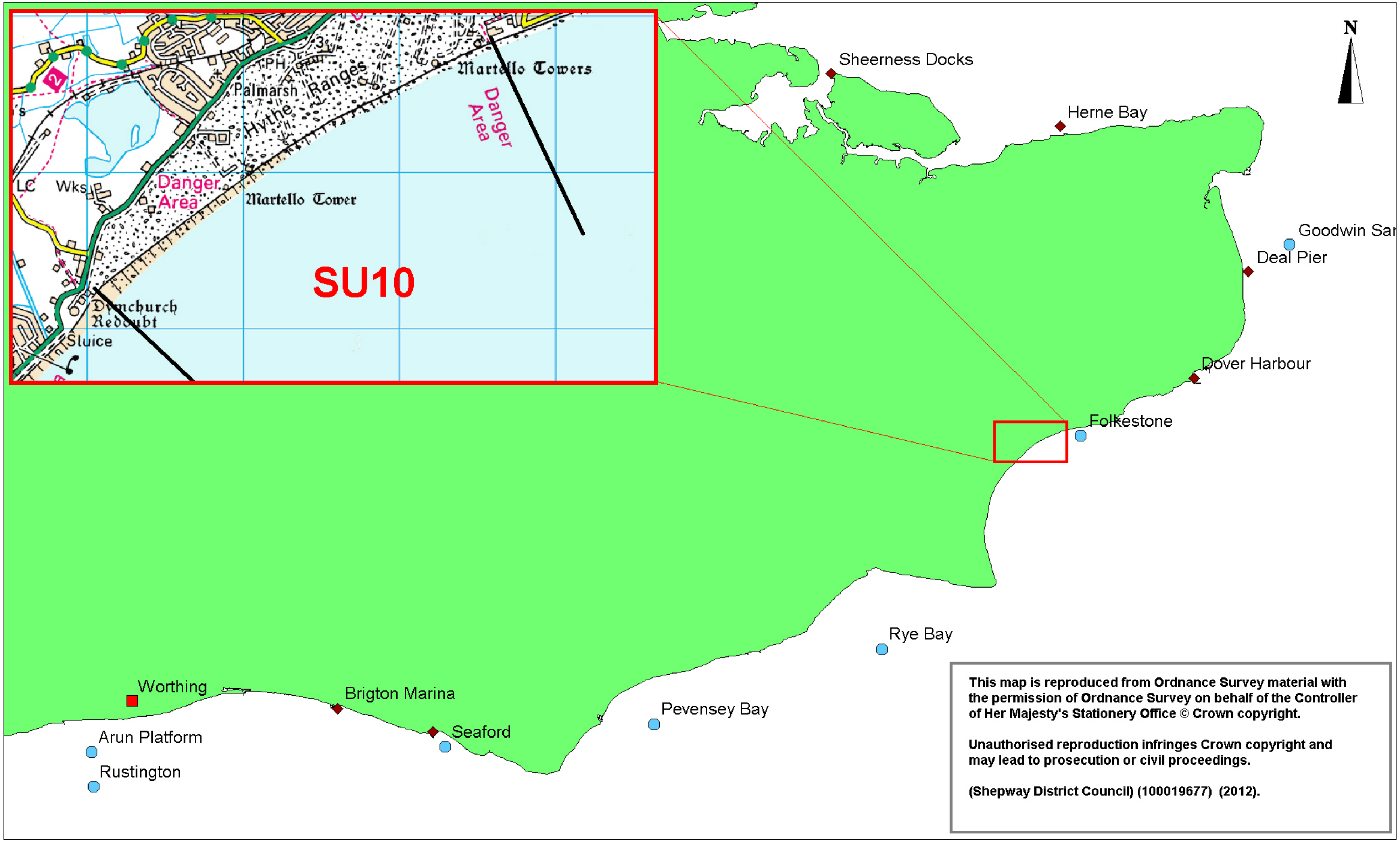


Figure 1.1: Site Location and Wave/Tide Gauges

2.0 Design Conditions

The existing shingle beach and revetted shingle/earth embankment form the only line of defence along the Hythe Ranges frontage. There is no formal design for these defences, although through recent studies undertaken for this frontage it has been established that the standard of protection that is provided by the flood embankment is highly dependent upon the presence of a healthy beach. Whilst no design beach conditions currently exist, it is possible to derive some outline performance criteria from the work that has been undertaken previously.

In this, the overtopping assessments that were carried out identified that a significant reduction in the current standard of protection would occur as a result of only 1m reduction in beach elevation. The monitoring that has been carried out since 2003 has shown that the crest heights have remained stable, however, the frontage appears to regularly redistribute sediment along the frontage.

For a large majority of the frontage the crest height and width have not changed significantly regardless of any erosion that may have taken place. This should therefore maintain the standard of protection provided by the beach and ensure that the earth embankment remains stable.

Previous years have illustrated that this Survey Unit has remained relatively stable however during this reporting period the trend has now been reversed. Since 2003 this section has a net loss of approximately -11,990m^3. It is important to note that the loss is relatively insignificant when considering the scale of the Survey Unit, however areas such as Section 5 need to be continually monitored to determine whether the erosion rates witnessed in this reporting period are set to continue.

The reasonable groyne condition was considered to be a fundamental reason to why this section has shown low erosion rates in the past, however when considering the current reporting period it can be stated that the groynes had not been as effective in reducing the migration of shingle, and/or the volume of material of material entering this section has decreased. This may be a result of either, their poor condition, the groynes reaching their maximum capacity, and/or more frequent storm events (Section 5).

3.0 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).

3.1 Topographic Surveys

The schedule of completed surveys since the start of the Regional Monitoring Programme is given in Table 1 below. Digital Ground Models of the 2012 Beach Management Plan topographic survey are shown in Plate 2 (1 - 4) (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

4cSU10		
Profile	**Beach Plan**	**Post-storm**
14/09/2003	14/09/2003	
	25/05/2005	
	21/11/2006	
04/07/2007	04/07/2007	
28/10/2007		
08/03/2008		
03/06/2008	03/06/2008	
16/11/2008		
14/02/2009	23/08/09	
25/10/2009		
28/03/2010		
	15/08/2010	
23/10/2010		
05/03/2011		
15/08/2011	15/08/2011	
28/10/2011		
2703/2012	27/07/2012	

3.2 Bathymetric Surveys

The schedule of surveys since the start of the Regional Monitoring Programme is given in Table 2 below.

Table 2.2: Schedule of Bathymetric Surveys

4cSU10		
Date	**Line Spacing**	**Distance Offshore**
28/09/2003	0.5M	1km
25/06/2006	0.5M	1km

4.0 Beach Management Operations

The Hythe Ranges frontage is managed and maintained by the Ministry of Defence. As part of this ongoing management, minor repairs are made to the existing groyne field when required although future works to the frontage are being considered in the latest strategy. No formal maintenance of the shingle beach is currently carried out by the MOD.

5.0 Analysis

The 4cSU10 frontage has been divided up into 44 individual polygons, each representative of a single groyne bay. The numbering system adopted for these polygons is based on the numbering system that is already in use along this frontage for monitoring the condition of the timber groynes. These are numbered from 1 to 45 from east to west and consequently, the numbering for the change polygons follows suit, i.e. Polygon 1 being the bay between Groynes 1 and 2 and Polygon 2 being the bay between Groynes 2 and 3, etc. In addition, the entire unit has been divided into 5 sections in order to aid analysis (Figure 3.1).

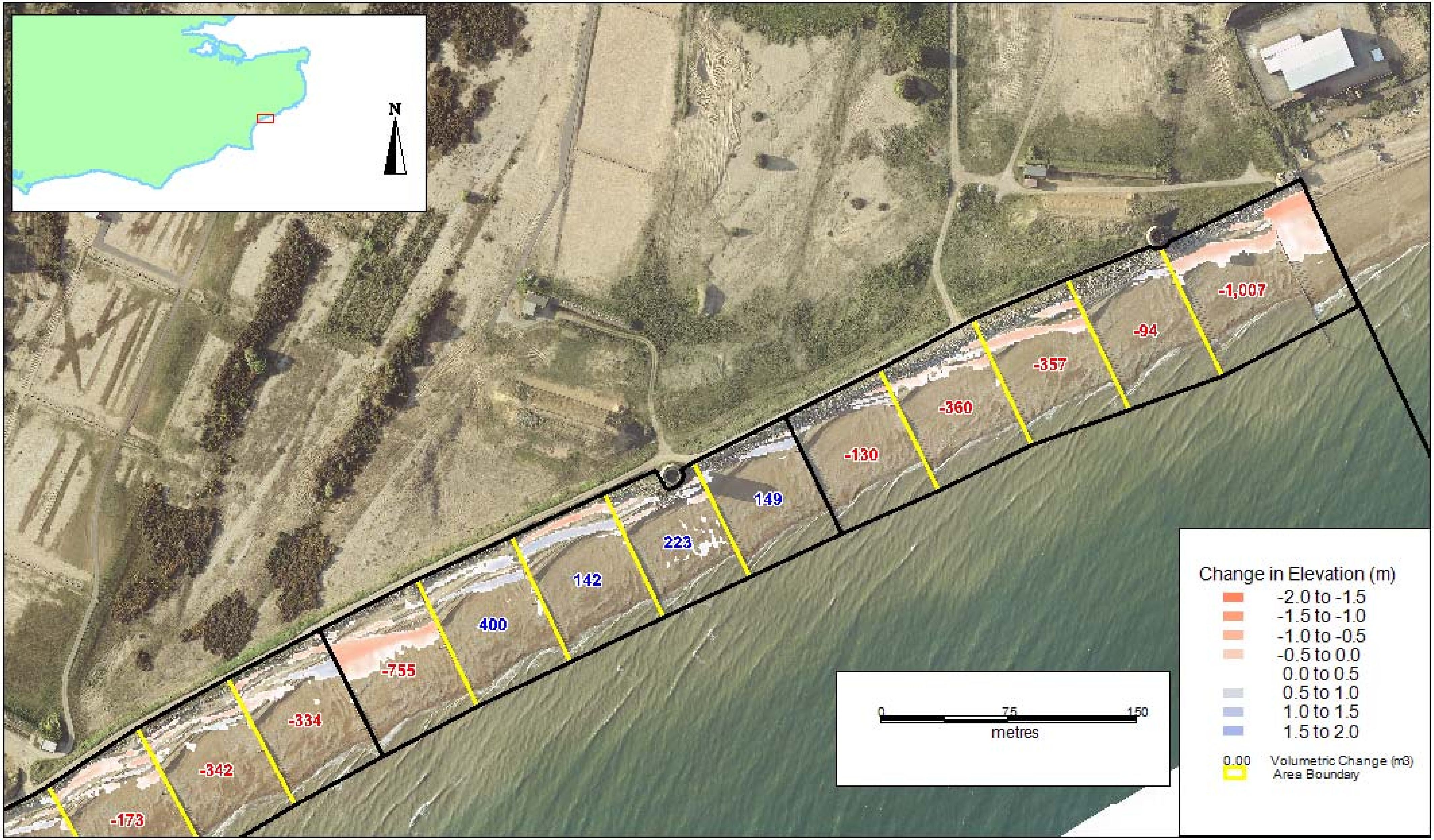
Table 5.1 provides a summary of volume change within each section during the period between the 2011 and 2012 summer surveys.

Table 5.1: 4cSU10 - Summary of Erosion/Accretion for 2010-2012

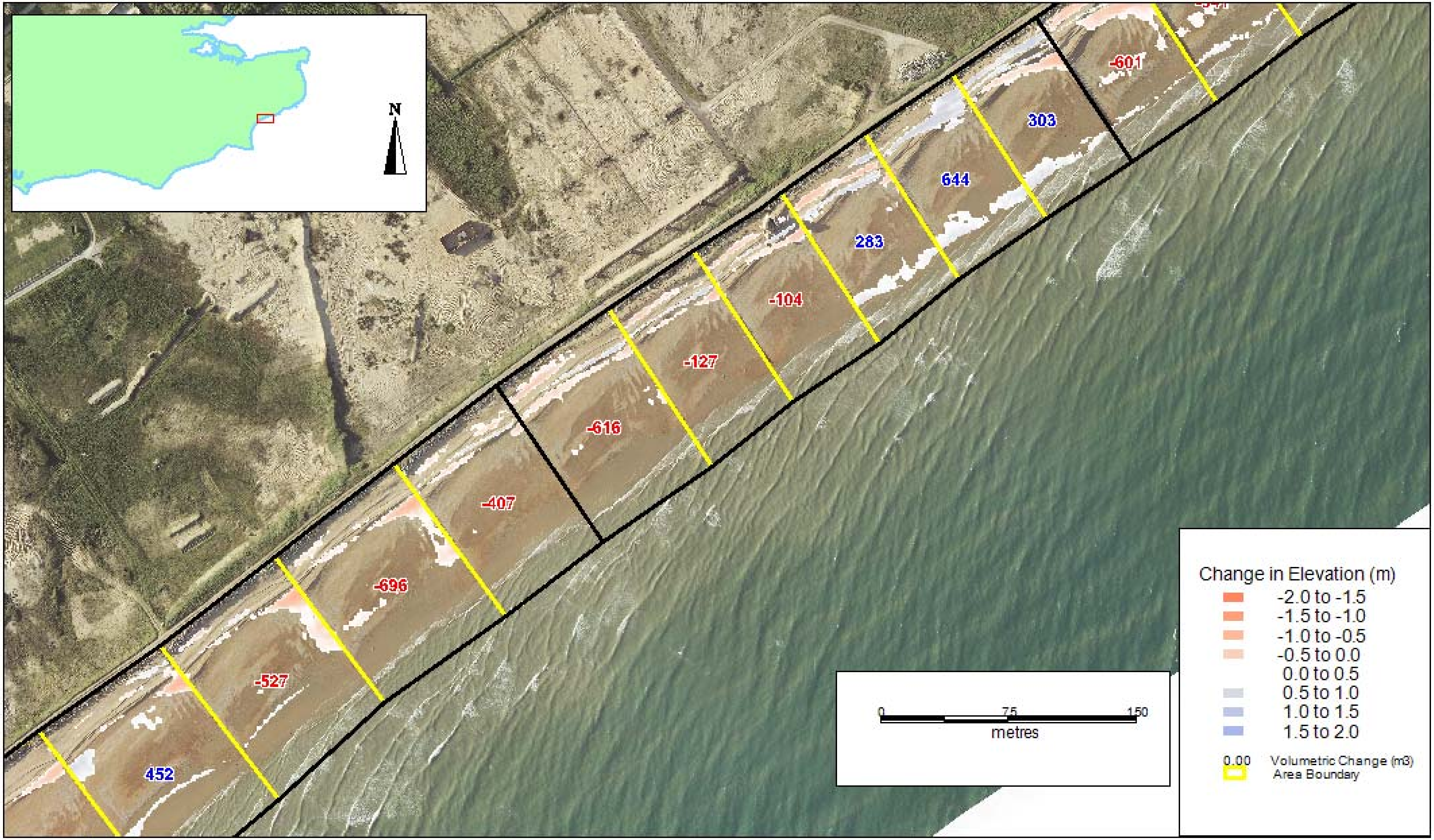
Polygon	Area (m²)	Error Estimate* (m³)	Erosion/Accretion (2010 to 2011) (m³)	Erosion/Accretion (2011 to 2012) (m³)
1-5	27,240	*+/- 817*	**-780**	**-1,948**
6-10	23,910	*+/- 717*	**182**	**159**
11-28	102,100	*+/- 3,063*	**-97**	**-3,495**
29-34	40,520	*+/- 1,215*	**-900**	**383**
35-44	117,800	*+/- 3,534*	**-383**	**-7,718**
Net			**-1,978**	**-12,619**

* Significant Change is highlighted through shading. (Blue is accretion, red is erosion). Significant change includes values which exceed the error estimates which are calculated as the survey area is multiplied by a +/-30mm error margin. Although unlikely, the error of the combined surveys can be up to double this figure.

Figure 3.1: 4cSU10 Beach Analysis Sections


-1,007
-94
-357
-360
-130
149
223
142
400
-755
-334
-342
-173
N
0
75
150
metres
Change in Elevation (m)
-2.0 to -1.5
-1.5 to -1.0
-1.0 to -0.5
-0.5 to 0.0
0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
0.00 Volumetric Change (m3)
Area Boundary


-17
-78
94
974
531
357
102
-354
-671
-145
-102
-267
-609
-1,336
-541
N
0
75
150
metres
Change in Elevation (m)
-2.0 to -1.5
-1.5 to -1.0
-1.0 to -0.5
-0.5 to 0.0
0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
0.00 Volumetric Change (m3)
Area Boundary


N
-601
303
644
283
-104
-127
-616
-407
-696
-527
452
0
75
150
metres
Change in Elevation (m)
-2.0 to -1.5
-1.5 to -1.0
-1.0 to -0.5
-0.5 to 0.0
0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
0.00 Volumetric Change (m3)
Area Boundary


N
452
252
-1,054
-804
-346
-912
-3,676
0
75
150
metres
Change in Elevation (m)
-2.0 to -1.5
-1.5 to -1.0
-1.0 to -0.5
-0.5 to 0.0
0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
0.00 Volumetric Change (m3)
Area Boundary

5.1 Difference Models

Now that the 2012 BMP data set has been compiled, it is possible to overlay the results of the survey with BMP data from 2011. 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 1 (1-5), which indicates areas of net erosion or accretion and the location of any extraction/deposition sites (N.B. ≤0.25m difference in elevation is considered as “no change”).

Negative values represent erosion that has occurred between 2011 & 2012, 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.

5.2 Profile Evolution

While beach plan surveys provide a more accurate view of morphological change and beach volume levels, profiles clearly illustrate the changes in beach cross section. The 2012 BMP survey beach profiles have been cross-referenced with the other profile surveys carried out over the past year 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.

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 face and the foreshore (i.e. the beach toe). 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.

5.3 4cSU10 Analysis

5.3.1 Section 1 - Polygons 1 to 5 (Profiles 4c00347 – 4c00354)

Section 1 is the eastern-most section in 4cSU10. During 2011-2012 experienced minor change, with a net loss of 1,948m^3. Analysis of the difference model shows that Polygon 1 has experienced the most erosion, with a loss of 1,007m^3. The loss is similar to that of the previous year and may be due to the lack of a terminal structure at the eastern end of this survey unit allowing material to move eastwards under the dominant drift direction. Figure 5.2 below shows Profile 4c00348 which illustrates this change. Erosion is concentrated around the crest at MHWS, reducing the crest width by ~3m and thus the standard of protection provided by the beach. The remainder of the polygons in this section have seen little change and therefore remain relatively stable.

Figure 5.2: Profile 4c00348

5.3.2 Section 2 – Polygons 6 to 10 (Profiles 4c00355 – 4c00360)

During the current reporting period this section has shown negligible change with an insignificant net gain of 159m^3. This is comparable to that of the previous year and shows that this section may have reached its potential equilibrium where the groynes cannot hold anymore migrating shingle. It is however important to consider that the surveying error for this section is +/-717m^3 and therefore the net change in this section may be due to survey error rather than any particular trend.

When analysing the difference model it is evident that Polygon 10 has seen the most change with a net loss of 755m^3. When taking into account the previous reporting period this trend represents a complete reversal and highlights the variability of change along this section. It can therefore be stated that this section remains relatively stable with large material gains being cancelled out by similar losses.

Figure 5.3 shows that the 2012 cross sectional profile is partially below the mean profile which is compiled from data since 2003. Despite the 2012 profile being below the mean profile, it is important to recognise that it is a minor retreat and is unlikely to significantly reduce the standard of protection that this section of frontage provides.

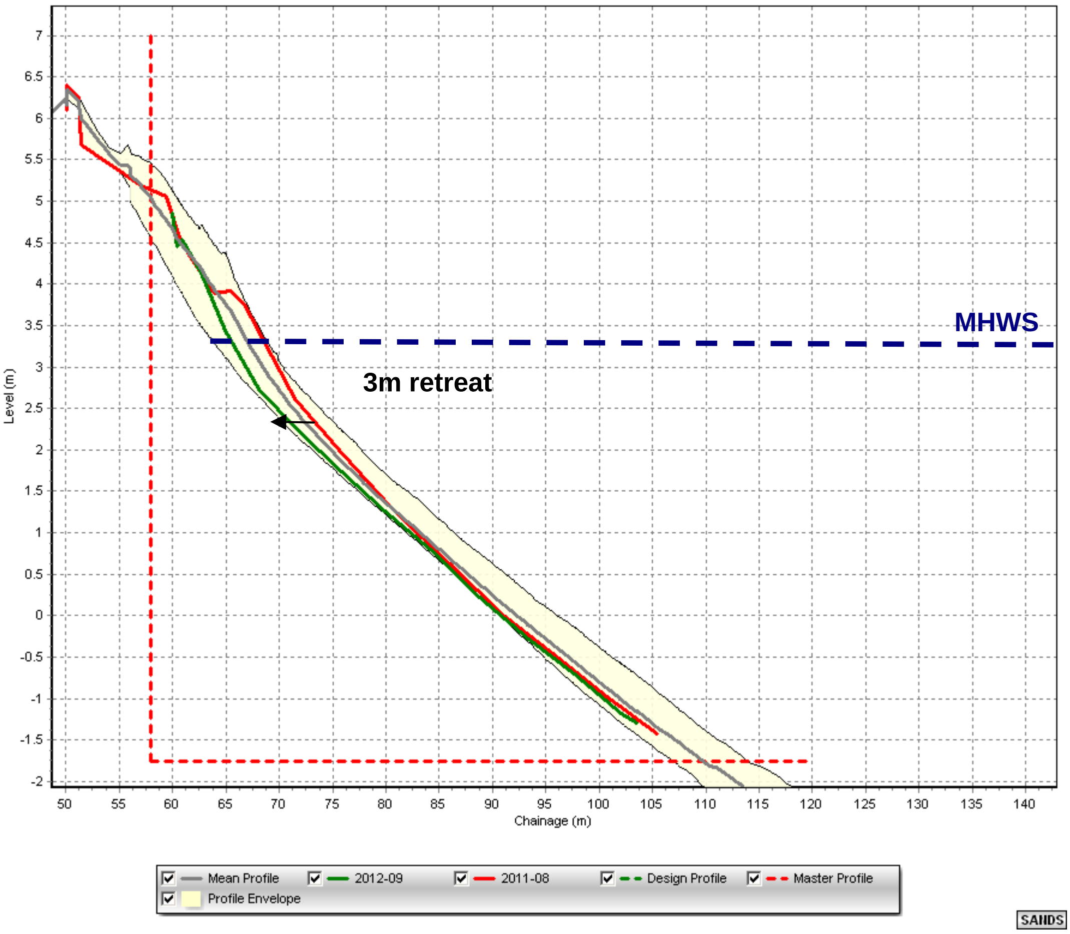


Figure 5.3: Profile 4c00360

5.3.3 Section 3 – Polygons 11 to 28 (Profiles 4c00362 – 4c00384)

During 2011/12, Section 3 has shown a net loss of 3,495m^3. This overall change is not significant when taking into account the entire section, however when evaluating each individual polygon it is apparent that this section remains dynamic with accretion and erosion explicitly present.

Erosion is mainly confined to the western half of this section with the eastern half showing both erosion and accretion. With such a variety of sediment changes occurring in each individual bay it is difficult to identify any specific trends. The only polygon to show any significant change is Polygon 26, where there has been significant erosion along the crest and upper slope, as illustrated by Profile 4c00382 (Figure 5.4).

When analysing Figure 5.4 it is apparent that the 2012 BMP survey follows the line of the lower profile envelope and consequently shows it is at the lowest level since 2003. When comparing it to the 2011 profile there has been a significant amount of erosion throughout the beach slope with up to 6m retreat on the upper slope. Since 2003 this bay has witnessed high volumes of both erosion and accretion. With no specific trends apparent, it can be stated that this section is likely to remain relatively stable with consecutive years cancelling the losses or gains of that of the previous year.

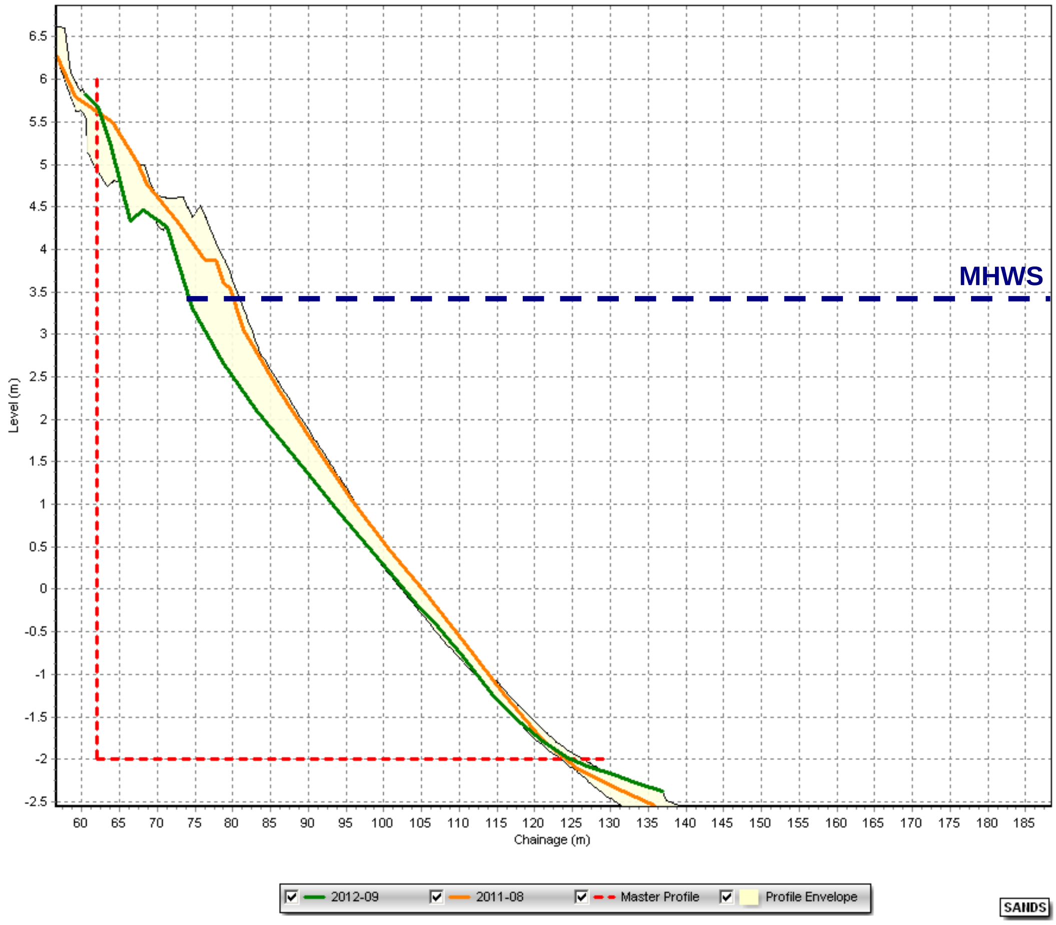


Figure 5.4: Profile 4c00382

5.3.4 Section 4 – Polygons 29 to 34 (Profiles 4c00386 – 4c00393)

Section 4 has seen minimal change during this reporting period with a gain of 383m^3. It is however important to note that the error estimate is significantly higher than the change displayed in this section.

When analysing the difference model it is evident that this frontage remains active with accretion and erosion clearly present. The pattern of change for this section is similar to that of previous years and is a consequence of the interaction of the groyne field slowing migration rates and trapping sediment.

Polygon 30 has seen a net gain of 644m^3 with the highest levels of accretion seen in the western side of this bay. As profiles lines are surveyed in the middle of this bay the cross sectional graph does not reflect this change in volume. Despite this, it can be the difference model shows that accretion is mainly confined to the crest, and for that reason will have a positive influence on increasing the standard of protection in this bay.

5.3.5 Section 5 – Polygons 35 to 44 (Profiles 4c00394 – 4c00403)

This section has seen the highest net change in this reporting period and since records began. Overall this section has displayed a loss of -7,718m^3. Past reporting periods had begun to indicate that this section had reached its potential equilibrium with preceding years illustrating negligible changes.

When analysing the difference model it is evident that erosion has mainly occurred in the far western end with Polygon 44 displaying a significant loss of 3,676m^3. From Figure 5.5 (Profile 4c00403) it is evident that the 2012 profile is significantly lower than in 2011. Erosion is evident throughout the entire slope and crest, which will have a negative impact on the standard of protection this section of frontage provides.

The significant level of erosion displayed in the western part of this section may be due to the material by-passing the groynes and is due to the groynes being in poor condition and having reached their maximum capacity. Only future surveys will determine whether this highly erosive reporting period was a one-off occurrence or whether it will determine a new trend.

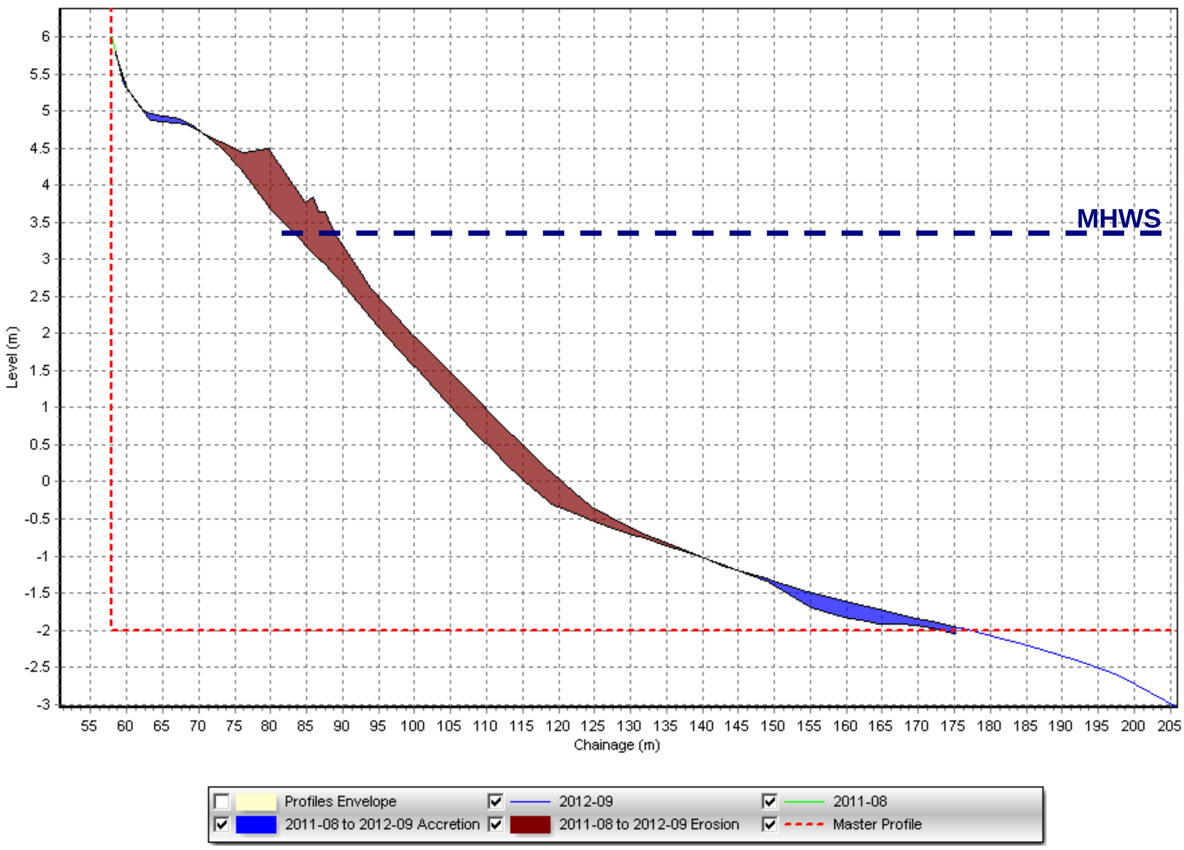


Figure 5.5: Profile Changes Plot for 4c00403

6.0 Long Term Summary

Overall Survey Unit 10 has shown a greater degree of loss than previous years, however this should be viewed as relatively negligible when considering the size of the unit.

When viewing the long-term trend of sediment movement in 4cSU10, it is apparent that both accretion and erosion are explicitly present in adjacent bays. It is believed that this primarily due to the volumes deviating around an equilibrium level where small changes are largely a reflection on the survey method. It would appear that this is the most feasible reason as the beach alignment, wave direction and groyne condition do not differ significantly over such short sections.

Continued monitoring is paramount to establishing whether the present trends identified represent a long-term movement to sediment stability or simply a short term misrepresentation. However it must be acknowledged that the condition and efficiency of the groyne bays is still the fundamental factor influencing sediment trends. This subsequently means that without continued maintenance the current trends may change significantly in future years. In conclusion, the stabilisation in sediment volume combined with continued groyne maintenance will help to maintain the standard of protection.

Table 6.1: Beach Volume Change Summary (2003 - 2012)

Polygon	Volume Change (m^3)								
	2003 - 2004	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	NET
1	581	-1,524	-265	186	-361	1,951	-929	-1,007	-1,368
2	71	-427	-559	75	-485	900	-325	-94	-844
3	-40	-273	-676	570	-352	151	139	-357	-838
4	241	-610	224	-61	-523	400	217	-360	-472
5	358	-92	-217	-235	-20	485	118	-130	267
6	-322	-287	5	-202	-42	214	-86	149	-571
7	-177	155	-407	73	-126	-23	-208	223	-490
8	-1,071	-348	-451	564	140	-546	-833	142	-2,403
9	-334	-1,178	722	-166	-216	154	466	400	-152
10	-617	-907	729	24	4	-91	843	-755	-770
11	46	-113	-81	98	22	558	-858	-334	-662
12	1023	-489	-548	-218	535	961	-291	-342	631
13	35	-208	51	125	-123	86	34	-173	-173
14	1	216	-142	169	274	81	-290	-78	231
15	-486	316	577	50	-501	-993	641	94	-302
16	661	-393	466	624	-85	-1263	-575	974	409
17	502	-1,218	961	206	-200	-258	-396	531	128
18	428	-1,276	1165	186	121	-613	-5	357	363

19	762	-762	463	-16	59	131	-188	102	**551**
20	1,220	223	-638	644	-124	643	3	-354	**1,617**
21	1,228	-746	-202	241	630	10	212	-671	**702**
22	-245	980	-480	-106	-7	-381	708	-145	**324**
23	307	-419	-282	-138	381	-636	672	-102	**-217**
24	195	-781	-268	353	247	188	327	-267	**-6**
25	652	-960	-386	632	175	303	235	-609	**42**
26	317	-779	846	-95	-106	556	-140	-1336	**-737**
27	964	-1,289	801	-243	514	4	-168	-541	**42**
28	222	-343	316	51	-538	-167	-18	-601	**-1,078**
29	-369	-96	533	368	-252	-872	-66	303	**-451**
30	-472	321	817	-31	20	-832	-342	644	**125**
31	0	-1,417	1482	792	322	-1075	186	283	**573**
32	399	-929	612	-287	122	160	-277	-104	**-304**
33	4	386	-73	-45	312	-154	21	-127	**324**
34	-539	-177	736	-146	65	-116	-422	-616	**-1,215**
35	857	-1,446	232	-338	16	42	-10	-407	**-1,054**
36	397	-2,031	727	-503	616	-4	187	-696	**-1,307**
37	314	-692	382	-345	272	421	-675	-527	**-850**
38	-1,008	711	22	-534	-464	-258	418	452	**-661**
39	461	-1,561	286	-1	-55	318	-252	252	**-552**
40	2,276	-500	96	27	-52	1025	-848	-1054	**970**
41	390	510	521	49	-911	-317	-122	-804	**-684**
42	2,132	770	-367	-1,069	-370	547	-232	-346	**1,065**
43	505	598	-1,823	-428	-242	247	1383	-912	**-672**
44	1,230	-875	-2,369	1,363	859	2,179	-232	-3,676	**-1,521**
NET	**13,099**	**-19,960**	**3,538**	**2,263**	**-449**	**4,116**	**-1,978**	**-12,619**	**-11,990**

7.0 General wave conditions

The wave data is recorded by a Datawell Directional WaveRider MkIII buoy in approximately 12.7m CD of water depth southeast of Folkestone. There were two storms exceeding the threshold in this reporting year. A detailed analysis of the wave climate for September 2011 to August 2012 is given in Annex D.

A storm is defined using the Peaks-over-Threshold method (Figure 7.1). Each storm is then examined in detail, and covers the period 16 hours either side of the storm peak, so as to include both the build-up and decay of the storm. This is the procedure recommended by the CIRIA Beach Management Manual (second edition) since it covers the build-up and decay typical of mid-latitudes depression.

The threshold used for Herne Bay is 1.6 m. This value has been determined using extremes analysis of 15 years of measured data (based on 3 hourly values). A 0.25 year return period is used to identify 4 storms in an average year.

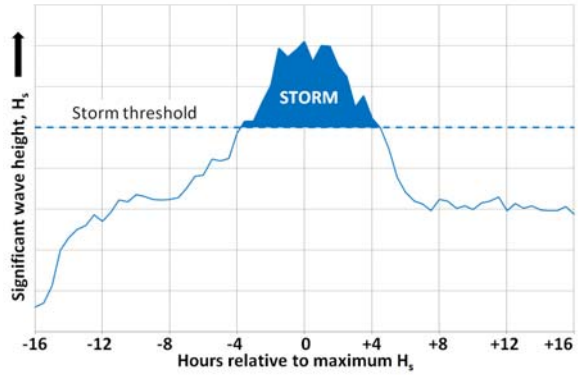


Figure 7.1 Peaks- threshold method

8.0 Storm performance of the beach

Only two storms exceeded the threshold during this reporting year, concentrated in December and early January (Figure 8.1). Storm wave direction was either S or SbyE. Apart from a few isolated periods of moderate waves, later January, February and March were unusually quiet.

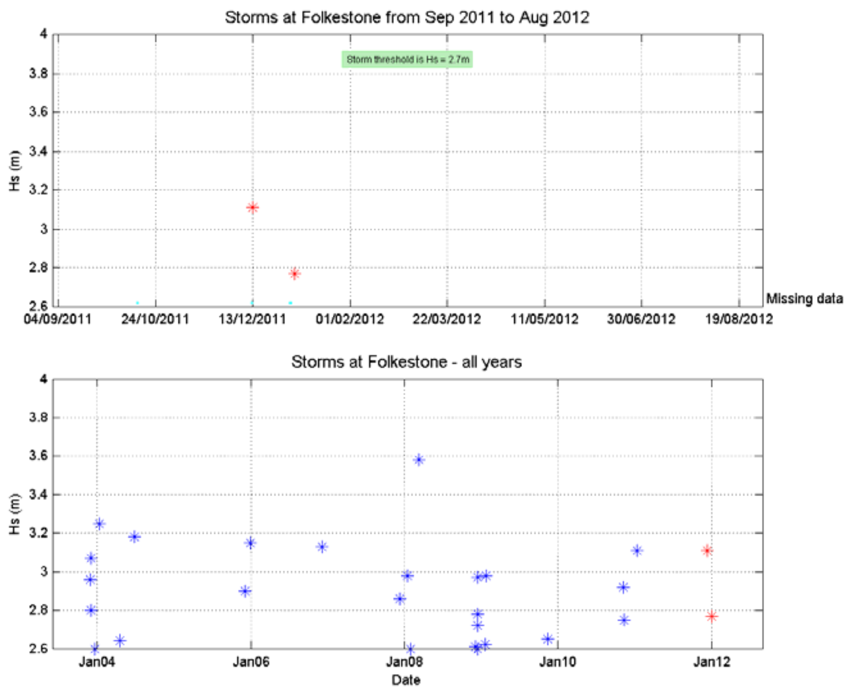
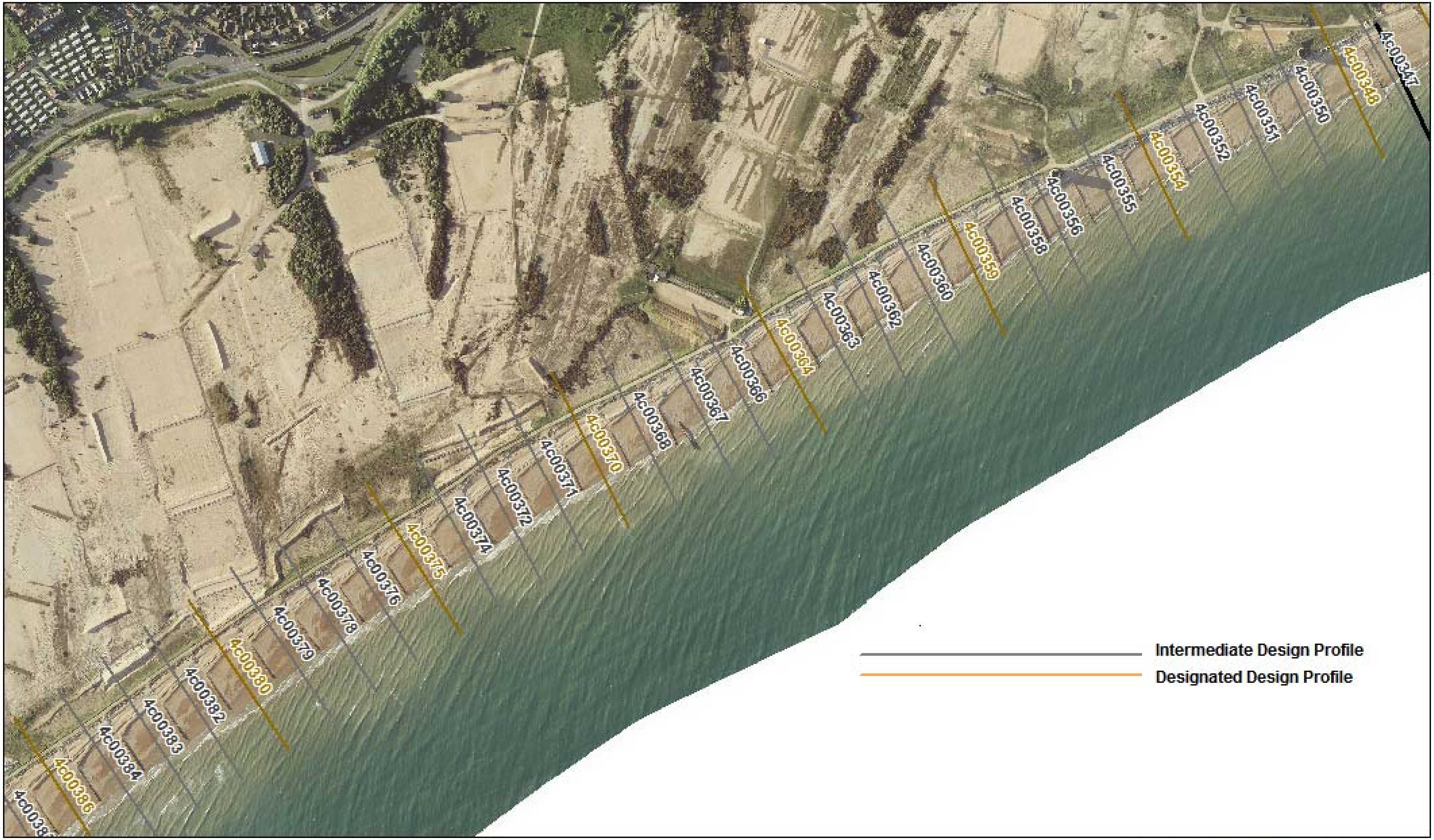


Figure 8.1 Storms at Folkestone 2011-2012

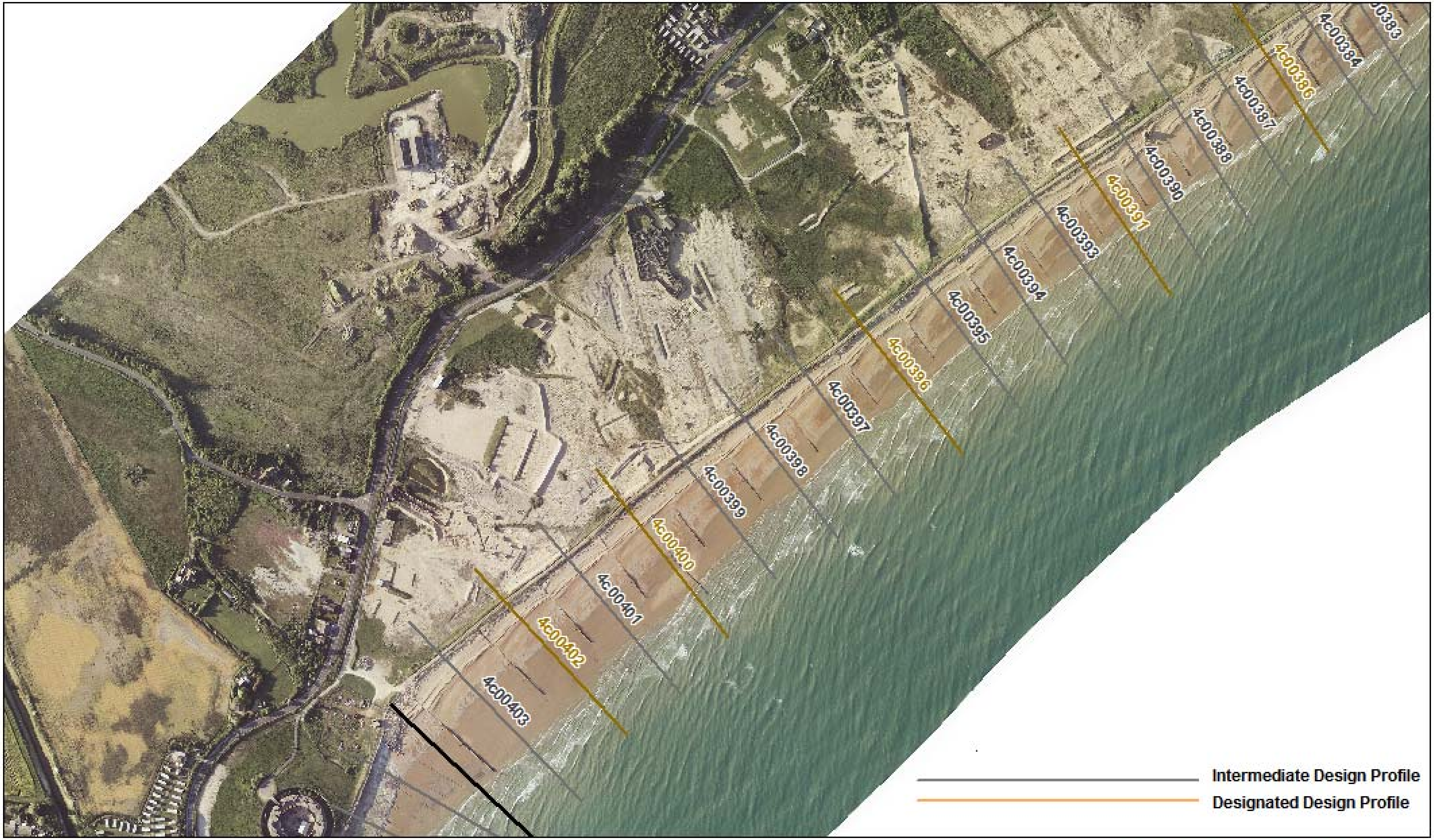
It is important to recognise the potential inconsistency in short-term trends. As with many coastal areas a lot of annual variability is expected, thus drawing conclusions with increased confidence will become possible as more data is collected, with regard to annual losses, net sediment drift and erosion/accretion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

Scheduled future monitoring includes profile surveys in Autumn 2012 and Spring 2013, and in addition post-storm surveys may be carried out if any event is deemed to have significantly affected the frontage. An interim report will be issued on completion of the spring profile survey, with the next BMP report scheduled to be issued after completion of the Summer 2013 beach plan survey. All historic monitoring data is accessible online (www.channelcoast.org), and future surveys will be available after satisfying quality assurance procedures.

Profile Location Diagrams



Profile Locations SU10



Profile Locations SU10