Beach Management Plan Site Report 2012
Survey Unit (SU) 20: Bulverhythe

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Annex A

Explanatory Notes
1. **Summary of method of conducting topographic and hydrographic surveys**  
(based on the Environment Agency's National Specification Sections XII and XIII)

Topographic cross-shore (profile) measurements are made at the intercept of the beach and a hard structure, at all changes of beach slope, at changes in surface sediment and at maximum defined intervals (every 5 metres). Each measurement is feature-coded with the type of surface material. Profiles are 100-500m apart, depending on management status. The seaward limit to be achieved is Mean Low Water Springs or 50 metres from the beach toe.

Topographic spot height (baseline) surveys are carried out annually at Beach Management Plan sites. Profiles are measured at 50m intervals, with the addition of spot heights at the toe of hard structures, the beach surface surrounding structures, all beach ridge crests, all other changes in slope and sediment changes, plus contour lines at a maximum spacing of 5m. All measurements are feature-coded with sediment type. Sufficient data points must be measured to generate a reliable Digital Terrain Model.

Hydrographic surveys are conducted with a single beam echo-sounder, with the position fixing requirement relaxed to DGPS. Soundings are taken along cross-shore profile lines 50m apart and extend 1km offshore. A minimum of 4 shore parallel tie lines are required (including one near the landward and seaward boundaries). The landward limit varies slightly across the region, due to the variation in tidal range, but in general is landward of Mean Sea Level, thus providing overlap with the topographic surveys. Tidal control may be by RTK GPS or by correction from tide gauges which are tied to the survey control network.

2. **Change in Cross-sectional Area (CSA)**

The annual change in cross-sectional area is calculated as the difference in CSA between two surveys, expressed as a percentage change compared to the earlier CSA.

\[
\frac{CSA_1 - CSA_2}{CSA_2} \times 100
\]

Eqn (1)

where CSA\(_1\) = most recent springtime survey and CSA\(_2\) = spring survey previous year. Therefore an annual change of −14% represents erosion during the last year of 14% of the area of last year's survey.

3. **Method of derivation of Digital Ground and difference models**

The Digital Ground Model is created by interpolating the points of a topographic baseline survey collected by using RTK GPS system. The interpolation method used to create the SECG DGMs is specified as Triangulation with smoothing and is applied in MapInfo Vertical Mapper to create a 1 metre resolution grid.

Triangulation is a process of grid generation that is usually applied to data that requires no regional averaging, such as elevation readings. The surface created by triangulation passes through all of the original data points while generating some degree of "overshoot" above local high values and "undershoot" below local low values. Elevation is an example of point values that are best "surfaced" with a technique that predicts some degree of over- and under- estimation. In modeling a topographic surface from
scattered elevation readings, it is not reasonable to assume that data points were collected at the absolute top or bottom of each local rise or depression in the land surface.

Triangulation involves a process whereby all the original data points are connected in space by a network of triangular faces, drawn as equilaterally as possible. This network of triangular faces is referred to as a Triangular Irregular Network (TIN). Points are connected based on the nearest neighbour relationship (the Delaunay criterion) which states that a circumcircle drawn around any triangle will not enclose the vertices of any other triangle.

To visualise the resulting grid, the same colour scheme is applied, thus enabling comparison between grids of different geographic origin. The colour bands cover a elevation range between -4 to +12 metres OD with elevations lying between -2 and + 5 metres OD are shown in 0.5 metres intervals, the remaining elevation bands shown in 1 metre intervals.

All difference models are created by using a grid calculator within the GIS system. For example the difference model of two baseline surveys is created by subtracting the earlier baseline grid from the most recent baseline grid:

\[ Grid_1 - Grid_2 \] Eqn (2)

where \( Grid_1 \) = most recent baseline grid and \( Grid_2 \) = previous baseline grid. Therefore an annual change of \(-14m^2\) represents erosion during the last year of \(14m^2\), whilst positive values represent accretion over the period.
Annex B

Digital Ground Models
Annex C

Recycling Logs
**DATE:** 27/10/2011  
**LOGGED BY:** Westminster Dredging  
**WORKS CODE:**  

**NOTES:** Weather Good

**FRONTAGE DESCRIPTION BEFORE MATERIAL PLACEMENT:** Bulverhythe Shingle Frontage

**FRONTAGE DESCRIPTION AFTER MATERIAL PLACEMENT:** e.g. material profiled, crest height, berm width, profile gradient, back tipped etc.

12,721m³ shingle pumped ashore by Westminster Dredging and spread over area indicated on the map.

<table>
<thead>
<tr>
<th>MATERIAL PLACED BETWEEN</th>
<th>QUANTITY OF MATERIAL</th>
<th>MATERIAL DESCRIPTION</th>
<th>Average cross-sectional area deposited (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile/ Groyne Number*</td>
<td>and: Profile/ Groyne Number*</td>
<td>Distance (m, alongshore)</td>
<td>Lorry capacity (m³)</td>
</tr>
<tr>
<td>See map</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Areas can be defined using ABMS Profile numbers (see map), groyne numbers, descriptions and/or drawn on map.
Annex D

*Pevensley Bay Waverider Buoy*

*Sept 2011 – Aug 2012*
Pevensey Bay Waverider Buoy - September 2011 to August 2012

Location
OS: 570429E 100915N
WGS84: Latitude: 50° 46.966' N  Longitude: 00° 24.975' E

Water Depth
~10 m CD

Instrument Type
Datawell Directional Waverider Mk III

Data Quality

<table>
<thead>
<tr>
<th>Recovery rate (%)</th>
<th>Sample interval</th>
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<tbody>
<tr>
<td>96</td>
<td>30 minutes</td>
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</tbody>
</table>

Storm Analysis

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>H_s (m)</th>
<th>T_p (s)</th>
<th>T_z (s)</th>
<th>Dir. (°)</th>
<th>Water level elevation* (OD)</th>
<th>Tidal stage (hours re. HW)</th>
<th>Tidal range (m)</th>
<th>Tidal surge* (m)</th>
<th>Max. surge* (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-Dec-2011 01:30</td>
<td>4.42</td>
<td>9.1</td>
<td>6.9</td>
<td>203</td>
<td>2.84</td>
<td>HW +1</td>
<td>5.5</td>
<td>0.32</td>
<td>0.43</td>
</tr>
<tr>
<td>03-Jan-2012 13:00</td>
<td>3.51</td>
<td>10.0</td>
<td>6.0</td>
<td>214</td>
<td>-0.84</td>
<td>HW +6</td>
<td>2.7</td>
<td>0.38</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Table D1: Highest storms during the reporting period, September 2011 to August 2012

A storm is defined using the Peaks-over-Threshold method (Figure D1). 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-latitude depressions.

The threshold used for Pevensey Bay is 3.5 m. This value has been determined using extremes analysis of 8 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.

* Tidal information is obtained from the nearest recording tide gauge (the National Network gauge at Newhaven). The surge shown is the residual at the time of the highest H_s. The maximum tidal surge is the largest positive surge during the storm event.
Summary

Although there were only 2 storms exceeding the threshold during this reporting year, the storm on 13 December 2011 recorded the highest waves since the deployment of the Waverider in 2003. Storm wave direction was SSW or SWbyS.

Figure D2: Incidence of storms during reporting period (top) and since deployment (bottom)

Acknowledgements

Tidal data were supplied by the British Oceanographic Data Centre as part of the function of the National Tidal and Sea Level Facility, hosted by the Proudman Oceanographic Laboratory and funded by DEFRA and the Natural Environment Research Council.
Monthly time series of $H_s$

Figure D3: Monthly time series of $H_s$ at Pevensey Bay. Storm threshold, shown in red, is 3.5 m
**Highest storm**

This was the largest storm recorded by the Waverider since its deployment in 2003 and similarly at Seaford and Rustington. It was associated with a very deep depression (central pressure 946 hPa), situated to the west of Scotland (Figure D5) and saw a typical rapid rise in significant wave height from 3 to ~4.5m and subsequent decay within 8 hours. Wave direction backed from SW to SSW during the hours of highest waves, veering back to SW as the seas reduced below 2 m. The main period of high waves spanned High Water, on a spring tide, but tidal surge (at Newhaven) was fairly small (~0.3 m).

*Figure D4: Highest storm of the reporting period*
Figure D5: Surface Pressure chart on 13 December 2011 at 00:00Z

Figure D6: Surface Pressure chart on 14 December 2011 at 00:00Z
Second highest storm

This storm resulted from deep depression (968 hPa) which tracked quite slowly across northern Britain, then remained ~stationary near southern Norway with a complex series of fronts across southern England (Figures D8 and D9). Significant wave height exceeded 3m for about 6 hours. The storm peak was around Low Water on a neap tide, accompanied by a fairly small tidal surge (at Newhaven).

Figure D7: Second highest storm of the reporting period
Figure D8: Surface Pressure chart on 03 January 2012 at 00:00Z

Figure D9: Surface Pressure chart on 04 January 2012 at 00:00Z