South West Regional Coastal Monitoring Programme

Annual Survey Report
Start Point to Lizard Point
2021

AR 97 Rev 1.0
November 2021

PLYMOUTH COASTAL OBSERVATORY
## Document Information

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Annual Survey Report 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>AR 97</td>
</tr>
<tr>
<td>Status</td>
<td>Final</td>
</tr>
<tr>
<td>Date</td>
<td>May 2021</td>
</tr>
<tr>
<td>Project Name</td>
<td>South West Regional Coastal Monitoring Programme</td>
</tr>
<tr>
<td>Author</td>
<td>J Saunders</td>
</tr>
<tr>
<td>Checked By</td>
<td>R Adams</td>
</tr>
</tbody>
</table>

## Revisions

<table>
<thead>
<tr>
<th>Revision Number</th>
<th>Revision Reference</th>
<th>AR 97 Rev 1.0</th>
<th>Date</th>
<th>November 2021</th>
</tr>
</thead>
</table>
6d6D5-12 - Coverack ................................................................. 236
6d6D5-14 - Kennack Sands East ........................................... 243
6d6D5-15 - Kennack Sands West .......................................... 248
6d6D5-17 - Cadgwith ............................................................. 256
Summary

This report contains changes to beach and wave conditions from measurements recorded by the South West Regional Coastal Monitoring Programme in the area between Start Point to Lizard Point. Comparisons are made between the 2021 data with the 2020 spring and 2007 baseline data.

Over the last year the majority of survey units have remained in a stable state. The percentage change in cross sectional area across the process cell is relatively small with only a minority of profiles experiencing significant gains or loss. Most profiles have also remained stable in shape experiencing only a minor redistribution of material. Only survey units 6cSU33 (Wembury), 6d6D5-14 (Kennack Sands East) and 6d6D5-15 (Kennack Sands West) showed significant combined loss in material. Irrespectively, survey units 6cSU30-4 (Thurlestone), 6cSU31-2 (Bigbury), 6d6D1-4 (Seaton), 6d6D1-8 (Looe), 6d6D2-17 (Gorran Haven) and 6d6D3-10 (Carne) showed relative combined increase in material.

Since 2007 there has been a wide variability in both actual change and percentage change across the process cell. Many survey units have remained stable with minimal change occurring across all profiles in the unit. However, survey units 6cSU30-4 (Thurlestone), 6d6D2-7 (Carlyon Bay), 6d6D5-14 (Kennack Sands East) and 6d6D5-15 (Kennack Sands West) have shown comparative loss of material, whereas a considerable number have gained material; 6cSU28 (Salcombe), 6cSU31-1 (Bantham), 6cSU31-2 (Bigbury), 6cSU31-3 (Challaborough) 6cSU33 (Wembury), 6d6D1-4 (Seaton), 6d6D1-6 (Looe), 6d6D1-8 (Talland), 6d6D2-4 (Par Sands), 6d6D3-4 (Porthluney Cove), 6d6D3-10 (Carne), 6d6D3-12 (Portscatho) and 6d6D5-4 (Maenporth).

The repeat baseline for survey unit 6d6D2-7 (Carlyon Bay) has lost over 12,228 m$^3$ (1.9%) of material in comparison to 2020. Erosion dominates the survey unit with high level erosion occurring towards the lower beach face and at the back of the beach. In comparison to the 2007 baseline, there has been a loss of over 14,719 m$^3$ (~4.9 %) of beach volume. Analysis suggests an east to west rotation of the beach.

Of the storms recorded by the Looe Bay Directional Waverider (DWR) between January 2020 and April 2021, six exceeded the 3.73 m storm threshold. The most significant storm recorded by the Looe DWR between January 2020 and April 2021 occurred on 30 January 2021 at high tide, with a significant wave height of 4.2 m, a joint return period of 1 in 5 years. The predominant wave direction recorded at the buoy is from the southwest.
South West Regional Coastal Monitoring Programme

Annual Survey Report 2021 – Start Point to Lizard Point

1.0 Introduction

Analysis presented in this report provides an overview of beach changes and wave and tidal measurements since the commencement of the South West Regional Coastal Monitoring Programme (SWRCMP). The first beach surveys took place during the Spring of 2007 and changes are reported until Summer 2021.

2.0 Methodology

2.1 Hydrodynamics

Wave and Tidal reports are presented, where applicable, for those wave buoys and tide gauges within the area (Start Point to Lizard Point) showing analysis from January 2020 to April 2021. Reports are prepared and checked on behalf of the SWRCMP by the Channel Coastal Observatory; for all other hydrodynamic reports and information on their methodology please see here.

2.2 Topographic Survey

Profile Data

Each survey unit in this report consists of a select number of pre-determined cross-shore profiles which have remained constant throughout the programme. Analysis of cross-sectional area (CSA) change is conducted for each individual profile for each separate survey unit. Changes in CSA are measured relative to the Master Profile which is defined by a stable landward position and the Mean Low Water Springs (MLWS) level (Fig.1).

![Figure 1 - Example Master Profile with CSA Calculated from the Surveyed GPS Profile](image-url)
In cases where none of these levels can be reached the Master Profile is placed at the most appropriate level for the survey unit in question.

Where possible, identical depth boundaries have been used for all profiles within a survey unit. However, even where this has not been possible, direct comparisons can be made for the beach cross-sectional area at one profile over time, since the Master Profile is constant for each profile (Fig.1). In some instances, raising the lower depth of the Master Profile may reduce the overall cross-sectional area of the profile. This may cause small changes in the beach profile to have a large impact on the percentage change. This effect has been taken into account in the analysis of change to beach profiles.

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

$$\frac{\text{CSA}_1 - \text{CSA}_2}{\text{CSA}_2} \times 100$$  eqn (1)

whereby CSA$_1$ is the most recent Spring survey and CSA$_2$ is the Spring survey from the previous year. Therefore an annual change of $-14\%$ represents a loss of $14\%$ of the previous years CSA.

**Interim Data**

As part of the Monitoring Programme specification, each survey unit receives at least a Spring interim survey every year (conducted between January and April), with more vulnerable sites also receiving an Autumn interim survey every year (conducted between September and December). An interim survey consists of a full profile survey of select profiles across the survey unit.

For the purpose of this report, Spring survey profiles from the current year are compared with the 2020 Spring interim and the initial baseline survey, predominantly conducted in 2007.

**Baseline Data**

As part of the Monitoring Programme specification, each survey unit receives a full topographic baseline survey once every six years. In addition, highly managed sites, or those with a beach management plan, receive an annual baseline survey. Baseline surveys include a full profile survey at 5 m intervals and continuous spot height data collected at approximately 1 m intervals across the whole beach to the height of MLWS. This continuous data also includes a feature code for each spot height data point recorded, indicating the surface sediment type.

Where there are at least two baseline surveys for a survey unit, a topographic difference model is produced based on the spot height elevations. The raw spot height data is processed into a Digital Terrain Model (DTM) and successive models are subtracted from one another to produce a difference model for the survey unit. In some cases, where there is no topographic baseline data collected, the information described above may be derived from LiDAR data.

Net sediment volume change ($m^3$) can be derived across each individual survey unit over time. The initial volumes are derived from the DTM made for consecutive baseline topographic
surveys. Both models are clipped to cover the same area, and a volume above the MLWS plane is calculated for each DTM. The net sediment change is calculated as:

\[ \text{Vol}_1 - \text{Vol}_2 \quad \text{eqn (2)} \]

where \( \text{Vol}_1 = \) most recent DTM model volume and \( \text{Vol}_2 = \) earlier DTM model volume. Therefore a net change of \(-19,000 \text{ m}^3\) represents erosion since the earlier survey.

3.0 Data Analysis

Data are presented and calculated at the following levels:

3.1 Hydrodynamic Reports

Wave Buoy reports, where applicable, include analysis on monthly averages from January 2020 to April 2021, incorporating the 2020/21 storm season along with monthly averages for all years for the following hydrodynamic parameters:

- \( H_s \) – Significant Wave Height (m)
- \( T_p \) – Peak Wave Period (s)
- \( T_z \) – Average Wave Period (s)
- Direction – Wave Direction (°)
- \( \text{SST} \) – Sea Surface Temperature (°C)
- Bimodal Seas (%)  
- Storm Joint Return period

Additional analysis includes listing the statistics for the five most energetic storms alongside significant wave height return periods and parameter exceedance limits from January 2020 to April 2021.

Tide reports, where applicable, include analysis of extreme monthly maxima and minima, surge maxima and surge minima and mean levels for January 2020 to April 2021. Additional analysis includes annual extreme maxima and minima from each year since the devices installation.

3.2 Process Cell Analysis

The Process Cell Summary maps contain an at-a-glance condition of each survey unit between Sand Point and Aust. Combined profile areas for each survey unit are compared and show actual profile change (m²) and percentage change between the:

- 2020 Spring interim and the 2021 Spring interim
- 2007 Baseline and the 2021 Spring interim

Colour-coded circles highlight areas of accretion, no change or erosion for each survey unit and identify survey units which might need closer examination. It is recommended that the user should use the maps to identify areas of interest and then further examine the individual profile charts and time series.

3.3 Survey Unit Analysis

Analysis has been conducted for those survey units where a minimum of three spring interim surveys have been recorded, with the following completed where applicable:

- Combined Profile Area Trend Analysis
Annual Survey Report  

Start Point to Lizard Point 2021

- CSA Time Series
- Profile Extremes Analysis
- Topographic Change Maps:
  - Detailed beach profile change from Spring 2020 to Spring 2021
  - Detailed beach profile change from Baseline 2007 to Spring 2021
- Individual Profile Charts

Combined Profile Area Trend Analysis

The combined profile trend in CSA is presented as a graph for each survey unit (example shown in Fig.2). All interim profile areas are combined for each interim and baseline survey conducted to date to provide a survey unit with a single ‘beach area’ known hence forth as the Combined Profile Area (CPA) to compare using linear trend analysis over a temporal scale.

Where profiles have been missed from a particular survey, the average of all surveys is taken to ensure a consistent ‘beach area’, if fewer than 75% of surveys have been conducted for a particular profile, the profile is omitted.

Where repeat baseline surveys are present, surface volumes were extracted from a common area and plotted on the third axis of the CPA plot.

![Combined Profile Area Trend Analysis](image)

*Figure 2 - Example of trend analysis for CPA for each interim and baseline survey with a linear trend rate highlighted at 28.4 m² y⁻¹ equating to the increase of 0.56% of the average CPA per year.*

Profile Extremes Analysis

For each impacted survey unit, the cross-sectional area for individual interim profiles are discussed. Profile extremes analysis plots show the current cross-sectional area (m²) with the range of previous recordings represented as error bars. This plot displays the range of change for each individual profile along with where the most recent survey is represented. An example is given in Figure 3.
CSA Time Series Plot

Cross-sectional area measurements (m²) for each interim profile at individual survey units are displayed on a separate plot for each interim and baseline survey conducted to date (example shown in Fig.4).

Figure 3 - Example plot showing the most recent CSA value recorded for three separate survey lines (green dots). The error bars represent the range of CSA recorded by each profile throughout the history of the monitoring data.

Figure 4 - Example of a cross-sectional area plot showing each of the interim profiles recorded for every interim and baseline survey since the 2007 baseline.
Topographic Change Maps

Topographic change maps show the location of each interim profile, superimposed on an aerial photograph.

The lines for beach profile change maps are colour-coded based on actual change; percentage change is displayed in brackets following the profile name on each line. Please note that lines on the map have been extended for clarity and therefore may not represent the actual distance surveyed. The annual change in cross-sectional area has been calculated from the 2021 Spring interim to the 2020 Spring interim and from the 2021 Spring interim to the original 2007 baseline.

Individual Profile Charts

Each interim profile is portrayed as a cross-sectional profile comparing the most recent Spring interim (blue), the previous Spring interim (green) and the original baseline (red). Profiles are displayed against the master profile (dotted red line).

4.0 Accuracy Statement

It must be appreciated that the accuracies of each measurement system must be taken into account when drawing conclusions, particularly from the difference models. In the case of topographic difference models from Real Time Kinematic (RTK) GPS surveys, the accuracy of each data point is ±0.03 m and therefore differences of ±0.06 m can generally be considered as "real", whilst smaller changes may be an artefact of the measuring system, and are considered to be "No Change".

Where LiDAR has been used to infill profile data, the accuracy is less precise as LiDAR data is delivered gridded to a 1 m horizontal resolution. However, the internal accuracy is higher and the vertical value will be accurate to ±0.04 m. LiDAR is poor at identifying sharp edges or steep slopes over short distances e.g. steep cliffs or seawalls, whereas a topographic survey will specifically pick up these changes in slope. However, LiDAR is excellent at providing a fuller picture over a wide surface which will indicate an overview of profile change, but to a lower precision than the RTK data. The location of the regularly surveyed profiles superimposed on the difference plots indicates how representative these profiles might be of overall changes.

5.0 Survey Schedules

Spring interim surveys are conducted between January and March each year. Baseline and repeat baseline surveys are carried out between April and August. A minimum of 12 weeks must elapse between successive interim surveys; 8 weeks must elapse between interim and repeat baseline surveys. The dates of individual surveys are given in the topographic survey record and with the analysis for each survey unit.

A full survey record including target and completion dates for all topographic surveys can be found on our website:

http://southwest.coastalmonitoring.org/topographic-survey-record-cell-6d/

For the most recent survey schedules for each survey unit please see:

http://southwest.coastalmonitoring.org/resources/survey-schedule/
Looe Bay Directional Waverider Buoy

Location

<table>
<thead>
<tr>
<th>OS</th>
<th>228541 E 51547 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>WGS84</td>
<td>Latitude: 50° 20.33’ N  Longitude: 04° 24.65’ W</td>
</tr>
</tbody>
</table>

Instrument type

Datawell Directional Waverider Mk III

Water depth

~10m CD

Buoy in situ in Looe Bay. Photo courtesy of Fugro GB Marine Limited

Location of buoy (Google mapping, image ©2016 Getmapping plc)

Data Quality

<table>
<thead>
<tr>
<th>Recovery rate (%)</th>
<th>Sample interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>97</td>
<td>30 minutes</td>
</tr>
</tbody>
</table>

Monthly Averages – 2020/21

All times are GMT

<table>
<thead>
<tr>
<th>Month</th>
<th>$H_s$ (m)</th>
<th>$T_p$ (s)</th>
<th>$T_z$ (s)</th>
<th>Dir. (°)</th>
<th>SST (°C)</th>
<th>Bimodal seas (%)</th>
<th>No. of days</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1.32</td>
<td>9.0</td>
<td>5.1</td>
<td>201</td>
<td>10.2</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>February</td>
<td>1.70</td>
<td>8.6</td>
<td>5.2</td>
<td>208</td>
<td>9.9</td>
<td>20</td>
<td>29</td>
</tr>
<tr>
<td>March</td>
<td>1.05</td>
<td>7.8</td>
<td>4.4</td>
<td>184</td>
<td>9.6</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>April</td>
<td>0.64</td>
<td>9.0</td>
<td>4.4</td>
<td>183</td>
<td>10.9</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>May</td>
<td>0.64</td>
<td>7.4</td>
<td>4.1</td>
<td>181</td>
<td>12.5</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>June</td>
<td>0.57</td>
<td>6.4</td>
<td>3.7</td>
<td>197</td>
<td>14.5</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>July</td>
<td>0.53</td>
<td>6.1</td>
<td>3.7</td>
<td>201</td>
<td>14.7</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td>August</td>
<td>0.73</td>
<td>6.8</td>
<td>4.1</td>
<td>203</td>
<td>17.1</td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td>September</td>
<td>0.51</td>
<td>7.5</td>
<td>3.9</td>
<td>196</td>
<td>16.4</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>October</td>
<td>1.05</td>
<td>7.4</td>
<td>4.4</td>
<td>197</td>
<td>14.7</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>November</td>
<td>1.13</td>
<td>8.3</td>
<td>4.5</td>
<td>196</td>
<td>12.9</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>December</td>
<td>1.20</td>
<td>9.3</td>
<td>5.0</td>
<td>203</td>
<td>11.3</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td>January</td>
<td>1.00</td>
<td>8.4</td>
<td>4.8</td>
<td>194</td>
<td>9.6</td>
<td>8</td>
<td>31</td>
</tr>
<tr>
<td>February</td>
<td>1.64</td>
<td>10.5</td>
<td>5.5</td>
<td>194</td>
<td>8.9</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>March</td>
<td>0.92</td>
<td>9.2</td>
<td>4.5</td>
<td>197</td>
<td>9.1</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>April</td>
<td>0.48</td>
<td>7.4</td>
<td>3.8</td>
<td>175</td>
<td>10.2</td>
<td>3</td>
<td>30</td>
</tr>
</tbody>
</table>
Monthly Averages - All Years (June 2009 – December 2020)

<table>
<thead>
<tr>
<th>Month</th>
<th>$H_s$ (m)</th>
<th>$T_p$ (s)</th>
<th>$T_z$ (s)</th>
<th>Dir. (°)</th>
<th>SST (°C)</th>
<th>Bimodal seas (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1.19</td>
<td>9.2</td>
<td>5.0</td>
<td>203</td>
<td>10.0</td>
<td>11</td>
</tr>
<tr>
<td>February</td>
<td>1.22</td>
<td>10.1</td>
<td>5.1</td>
<td>202</td>
<td>9.2</td>
<td>16</td>
</tr>
<tr>
<td>March</td>
<td>0.94</td>
<td>9.2</td>
<td>4.6</td>
<td>195</td>
<td>9.2</td>
<td>6</td>
</tr>
<tr>
<td>April</td>
<td>0.76</td>
<td>8.4</td>
<td>4.4</td>
<td>192</td>
<td>10.2</td>
<td>4</td>
</tr>
<tr>
<td>May</td>
<td>0.63</td>
<td>7.2</td>
<td>4.1</td>
<td>197</td>
<td>11.9</td>
<td>1</td>
</tr>
<tr>
<td>June</td>
<td>0.62</td>
<td>6.8</td>
<td>4.0</td>
<td>196</td>
<td>14.2</td>
<td>1</td>
</tr>
<tr>
<td>July</td>
<td>0.59</td>
<td>6.4</td>
<td>3.9</td>
<td>202</td>
<td>15.8</td>
<td>1</td>
</tr>
<tr>
<td>August</td>
<td>0.67</td>
<td>6.4</td>
<td>4.0</td>
<td>207</td>
<td>16.3</td>
<td>1</td>
</tr>
<tr>
<td>September</td>
<td>0.66</td>
<td>7.5</td>
<td>4.1</td>
<td>199</td>
<td>16.1</td>
<td>1</td>
</tr>
<tr>
<td>October</td>
<td>0.95</td>
<td>7.8</td>
<td>4.4</td>
<td>196</td>
<td>15.0</td>
<td>6</td>
</tr>
<tr>
<td>November</td>
<td>1.13</td>
<td>8.5</td>
<td>4.8</td>
<td>199</td>
<td>13.0</td>
<td>7</td>
</tr>
<tr>
<td>December</td>
<td>1.29</td>
<td>9.1</td>
<td>5.0</td>
<td>204</td>
<td>11.1</td>
<td>11</td>
</tr>
</tbody>
</table>

Storm Analysis (5 highest storms)

<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>16-Feb-2020</td>
<td>4.27</td>
<td>11.8</td>
<td>7.4</td>
<td>210</td>
<td>-1.52</td>
<td>HW +5</td>
<td>3.40</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>30-Jan-2021</td>
<td>4.20</td>
<td>18.2</td>
<td>10.0</td>
<td>205</td>
<td>2.39</td>
<td>HW</td>
<td>4.22</td>
<td>0.27</td>
<td>0.51</td>
</tr>
<tr>
<td>16-Dec-2020</td>
<td>4.05</td>
<td>10.5</td>
<td>6.8</td>
<td>208</td>
<td>2.18</td>
<td>HW +2</td>
<td>4.90</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>09-Feb-2020</td>
<td>4.03</td>
<td>10.5</td>
<td>7.0</td>
<td>212</td>
<td>0.00</td>
<td>HW -3</td>
<td>4.43</td>
<td>0.20</td>
<td>0.58</td>
</tr>
<tr>
<td>13-Jan-2020</td>
<td>3.83</td>
<td>10.0</td>
<td>6.6</td>
<td>211</td>
<td>1.28</td>
<td>HW -3</td>
<td>4.66</td>
<td>0.57</td>
<td>0.59</td>
</tr>
</tbody>
</table>

* Tidal information is obtained from the National Network gauge at Devonport and/or estimated from the predicted tide levels (Admiralty Total Tide). The surge shown is the residual at the time of the highest $H_s$. The maximum tidal surge is the largest surge during the storm event.
Joint return periods

Joint return periods for water level and significant wave height are based on 0.5 hourly records and calculated using a copula function. For more details on the copula function, see Dhoop & Thompson 2021. The grey point cloud represents the measured joint wave heights and water levels at Looe Bay and Devonport respectively, plotted against one another.

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Symbol</th>
<th>$H_s$ (m)</th>
<th>Water level elevation</th>
<th>Joint Return Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-Feb-2020 03:00:00</td>
<td>🔴</td>
<td>4.27</td>
<td>-1.52</td>
<td>1.70</td>
</tr>
<tr>
<td>30-Jan-2021 19:00:00</td>
<td>🔵</td>
<td>4.20</td>
<td>2.39</td>
<td>5.61</td>
</tr>
<tr>
<td>16-Dec-2020 06:30:00</td>
<td>🔺</td>
<td>4.05</td>
<td>2.18</td>
<td>5.40</td>
</tr>
<tr>
<td>09-Feb-2020 14:30:00</td>
<td>🔵</td>
<td>4.03</td>
<td>0.00</td>
<td>3.22</td>
</tr>
<tr>
<td>13-Jan-2020 17:00:00</td>
<td>🔸</td>
<td>3.83</td>
<td>1.28</td>
<td>4.50</td>
</tr>
</tbody>
</table>
## Annual Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Hs exceedance** (m)</th>
<th>Annual Maximum Hs</th>
<th>Date</th>
<th>A\textsubscript{max} (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.05%</td>
<td>0.5%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>2009</td>
<td>5.16</td>
<td>4.13</td>
<td>3.33</td>
<td>2.98</td>
</tr>
<tr>
<td>2010</td>
<td>4.06</td>
<td>3.04</td>
<td>2.72</td>
<td>2.37</td>
</tr>
<tr>
<td>2011</td>
<td>3.70</td>
<td>2.97</td>
<td>2.71</td>
<td>2.41</td>
</tr>
<tr>
<td>2012</td>
<td>4.60</td>
<td>3.37</td>
<td>2.88</td>
<td>2.56</td>
</tr>
<tr>
<td>2013</td>
<td>4.56</td>
<td>3.48</td>
<td>3.12</td>
<td>2.75</td>
</tr>
<tr>
<td>2014</td>
<td>6.31</td>
<td>4.05</td>
<td>3.53</td>
<td>3.08</td>
</tr>
<tr>
<td>2015</td>
<td>4.60</td>
<td>3.31</td>
<td>3.04</td>
<td>2.71</td>
</tr>
<tr>
<td>2016</td>
<td>4.23</td>
<td>3.21</td>
<td>2.97</td>
<td>2.50</td>
</tr>
<tr>
<td>2017</td>
<td>4.79</td>
<td>3.20</td>
<td>2.70</td>
<td>2.31</td>
</tr>
<tr>
<td>2018</td>
<td>4.07</td>
<td>3.34</td>
<td>2.96</td>
<td>2.63</td>
</tr>
<tr>
<td>2019</td>
<td>4.01</td>
<td>3.24</td>
<td>2.99</td>
<td>2.62</td>
</tr>
<tr>
<td>2020</td>
<td>3.99</td>
<td>3.45</td>
<td>3.13</td>
<td>2.72</td>
</tr>
</tbody>
</table>

** i.e. 5% of the H\textsubscript{s} values measured in 2009 exceeded 2.42 m

^*Note that waves were breaking at the buoy during this storm; where breaking waves were clearly present in the measured time series, the parameters have been omitted. Accordingly, there may have been short periods where measured significant wave heights exceeded this value.
Significant wave height return periods

Return periods for significant wave height can be calculated since the buoy has been deployed for more than 5 years. The return periods are based on 0.5 hourly records and are calculated for periods up to 10 times the record length using a peaks-over-threshold method and Generalised Pareto Distribution (GPD).

<table>
<thead>
<tr>
<th>Observation period</th>
<th>June 2009 to December 2020</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return period (years)</td>
<td>Significant wave height (m)</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td>3.73</td>
<td>No depth limitation</td>
</tr>
<tr>
<td>1</td>
<td>4.71</td>
<td>Depth-limited at MLWS</td>
</tr>
<tr>
<td>2</td>
<td>5.17</td>
<td>Depth-limited at MLWS</td>
</tr>
<tr>
<td>5</td>
<td>5.75</td>
<td>Depth-limited at MLWS</td>
</tr>
<tr>
<td>10</td>
<td>6.16</td>
<td>Depth-limited at MLWS</td>
</tr>
<tr>
<td>20</td>
<td>6.55</td>
<td>Depth-limited at MLWS</td>
</tr>
<tr>
<td>50</td>
<td>7.04</td>
<td>Depth-limited at MLWS</td>
</tr>
<tr>
<td>100</td>
<td>7.39</td>
<td>Depth-limited at MLWS</td>
</tr>
</tbody>
</table>

Distribution plots

The distribution of wave parameters are shown in the accompanying graphs of:

- Annual time series of $H_s$ (red line is 3.73 m storm alert threshold)
- Incidence of storms from January 2020 to April 2021 and all previous years. Storm events are defined using the Peaks-over-Threshold method. The highest $H_s$ of each storm event is shown
- Wave height exceedance each year since deployment
- Percentage of occurrence of $H_s$, $T_p$, $T_z$ and Direction from January 2020 to April 2021
- Wave rose (percentage of occurrence of direction vs. $H_s$) for all measured data
- Joint distribution of all parameters for all measured data, given as percentage of occurrence

General

The buoy, owned by Teignbridge District Council, was deployed on 22 June 2009, at which time the magnetic declination at the site was 3.2° west, changing by 0.15° east per year.

Acknowledgements

The shore station for the Waverider is kindly hosted by the Maritime & Coastguard Agency.

Tidal data at Devonport were provided by the British Oceanographic Data Centre from the UK national tide gauge network, owned and operated by the Environment Agency.
Looe Bay - Significant Wave Height (Hs) during 2020
Wave Report

Looe Bay - Significant Wave Height (Hs) during 2021

Storms at Looe Bay during 2020/21

Storm alert threshold is Hs = 3.73

Storms at Looe Bay - all years
Wave Report

Looe Bay 2020/21

Looe Bay - Wave height exceedence (Hs)

Looe Bay 2021

Histograms showing wave height (Hs), period (Tp), direction (Direction), and period (Tz) distributions for the year 2021.
South West Regional Coastal Monitoring Programme

Annual Survey Report 2021

Beach Change Summary - Baseline 2007 to Spring 2021

Actual Change (m²) in Cross-Sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

0 10 20 km

PLIMOUTH COASTAL OBSERVATORY

SDADCAG & CISCAG
Appendix A:

Individual Survey Unit Reports
Background

Salcombe consists of two beaches (North and South) facing east-southeast which are protected by the confines of Salcombe Harbour. North (South) beach has a cross shore length of ~150 m (~160 m) with a longshore length of ~230 m (~160 m) and both beaches have an average spring tidal range of 4.6 m. Both beaches are dissipative consisting of fine sand and are backed by sea walls protecting a through road.

Survey Unit Analysis

Analysis of the CPA plot (Fig.1) suggests that the survey unit recorded the lowest area for the initial baseline in 2007, and up to the spring interim in 2016 remained relatively stable. An accretion of ~40 m² was observed during the spring of 2016 followed by a further accretion of 30 m² during the autumn of 2016 since which it has remained relatively stable. Overall, the survey unit has seen an accretion rate of 6.7 m² y⁻¹ since 2007.

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU28, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Spring to spring analysis indicates profile 6c00256 has seen a 3% increase in cross-sectional area equating to a gain of 11.3 m² in material seen primarily across the lower beach face (Table 1). Profile 6c00264 saw a loss of material across the lower beach face, with smaller resultant gain directly below the seawall, resulting in a loss of 8.5 m².

Baseline – Spring
When comparing to 2007 baseline data, all profiles present distinctive increases in cross-sectional area (Table 1). All profiles have seen an increase in cross-sectional area across the entire beach face, with profile 6c00256 showing the largest change, accreting by 55.3 m² or by 14%.

Complete dataset comparison (2007-2021)
Profile 6c000256 recorded its highest CSA value to date during the most recent spring interim, with profiles 6c00264 and 6c00265A both showing high levels in comparison to previous years (Fig.2). When comparing individual CSA values from the 2021 spring interim to that of the entire dataset, all profiles have shown a steady accretion rate (Fig.3).

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU28.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring 09/03/2020 – 01/03/2021</th>
<th>Baseline to Spring 19/05/2007 - 01/03/2021</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6c00256</td>
<td>11.3</td>
<td>3</td>
<td>55.3</td>
</tr>
<tr>
<td>6c00264</td>
<td>-8.5</td>
<td>-3</td>
<td>28.7</td>
</tr>
<tr>
<td>6c00265A</td>
<td>1.9</td>
<td>1</td>
<td>17.8</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
South West Regional Coastal Monitoring Programme

Annual Survey Report 2021

Aerial Photography from 2018

FLYMORE COASTAL OBSERVATORY

Actural Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)
Survey Unit Boundary

Accretion
No Change
Erosion

> 30 m²
15 - 30 m²
5 - 15 m²
5 - 15 m²
> 30 m²

6cSU28: Salcombe - Beach Change

SDADCAG: South Devon
Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

- Survey Unit Boundary
- No Change
- Accretion
- Erosion

- $>$ 30 m²
- 15 - 30 m²
- 5 - 15 m²
- 5 m²
- 15 - 30 m²
- $>$ 30 m²

S W R C M P

6cSU28: Salcombe - Beach Change

SDADCAG: South Devon
Background

Hope Cove is a pocket beach which faces west and is confined by a rocky headland to the south and a smaller headland connected by a breakwater to the north. The beach has a cross-shore length of 135 m and longshore length of 345 m with an average spring tidal range of 4.6 m. The beach consists of sand, backed by a rocky cliff and sea wall, defending a through road. At spring high tide the remaining beach is confined to the northern end of the beach.

Survey Unit Analysis

Analysis of the CPA suggests the baseline of 2007 saw the lowest recorded area at 717 m² the unit was not surveyed again until the start of the second phase in February 2011 whereby the CPA had accreted by 48 m² (Fig.1). Since 2011, the CPA has accreted gradually with the exception of the February 2015 and March 2020 survey. Overall, the survey unit is accreting by 2.5 m² y⁻¹ since 2007.

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU30-2, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
When comparing the spring survey to that of last spring, both profiles have remained stable with minimal movement of sediment from the MLWS mark to the upper beach face (Table 1).

Baseline – Spring
When comparing the 2021 spring data to that of the 2007 baseline, both profiles, 6c00472A and 6c00478A, have increased in area by 8% and 6% respectively (Table 1). For 6c00472A, the increase is observed primarily along the low tide terrace whereas 6c00478A has seen higher sediment accumulation at both the seaward and landward extent of the profile.

Complete dataset comparison (2007-2021)
Both profiles recorded relatively high cross-sectional area when comparing to the entire dataset (Fig.2) and have remained stable over the last 10 years since the 2011 spring interim (Fig.3).

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU30-2.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Cross-Sectional Area</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring to Spring</td>
<td>Baseline to Spring</td>
</tr>
<tr>
<td></td>
<td>11/03/2020 – 29/03/2021</td>
<td>16/06/2007 - 29/03/2021</td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²) % Change</td>
<td>CSA Diff (m²) % Change</td>
</tr>
<tr>
<td>6c00472A</td>
<td>2.9 1</td>
<td>17.2</td>
</tr>
<tr>
<td>6c00478A</td>
<td>-4.3 -1</td>
<td>27.4</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

- 6c00472A (1%)
- No Change

Survey Unit Boundary
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion

No Change

Erosion

SDADCAG: South Devon

Aerial Photography from 2018

6cSU30-2: Hope Cove - Beach Change
Background

Thurlestone is separated into two beaches: South Milton and North Milton, each are backed by vegetated dune systems and sheltered by a rocky reef platform and headlands. The beaches face W-SW and have a bimodal wave climate of dominant south-westerlies and secondary south-south-easterly swell. South (North) Milton Sands has a cross-shore length of 90 m (118 m) and longshore length of 680 m (170 m) with a mean spring tidal range of 4.6 m.

Survey Unit Analysis

Analysis of CPA since 2007 suggests Thurlestone has undergone a regime shift after the 2013/14 winter period, whereby on average 150 m² was lost across all combined profiles, which have not recovered to their previous state. As a result, the beach is currently eroding at a rate of 17.6 m² y⁻¹ with the lowest recorded area observed for the 2020 spring interim (2,595 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU30-4, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

**Spring – Spring**

Spring to spring analysis suggests there has been a north to south rotation observed in the two bays, with profiles 6c00507 to 6c00513 increasing in cross-sectional area by between 14 m² and 65 m² (Table 1). In contrast, profiles 6c00517 has seen a loss of 17.1 m² across the entire beach face, with a 0.5 m loss from in front of the cliff face.

Similarly, North Milton Sands underwent a similar if less prominent rotation with profile 6c00524 gaining 18.1 m² and profile 6c00526 losing 7.6 m².

**Baseline – Spring**

When comparing 2021 spring interim data to that of the 2007 baseline, all profiles bar 6c00517 have shown a distinct loss of material ranging from 24 m² to 68 m² (Table 1). Profiles 6c00507, 6c00509, 6c00513 and 6c00524 have lost between 10 – 20 m width from the dune and upper beach face, attributable to the 2013/14 storm season. Profile 6c00517 indicated a 12% gain in sediment area across the entire beach face.

Profile 6c00526 indicated a 6% loss in cross-sectional area distributed evenly across the mid-section of the beach face.

**Complete Data Comparison (2007-2021)**

When comparing to the entire dataset (Fig.2), profiles 6c00507, 6c00509, 6c00524 and 6c00526 recorded below average cross-sectional area in the 2021 spring interim with 6c00526 recording the lowest value to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), all appear to be steadily eroding. Profiles 6c00507, 6c00509 and 6c00524 displayed considerable loss in cross-sectional area after the 2013/14 winter.

**Additional Comments**

Profile 6c00513 runs directly through the course of the river, which can have an impact on sediment formations and thus area recorded within the cross-section may vary.

### Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU30-4.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11/03/2020 - 29/03/2021</td>
<td>15/06/2007 - 29/03/2021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6c00507</td>
<td>17.1</td>
<td>4</td>
<td>-48.6</td>
</tr>
<tr>
<td>6c00509</td>
<td>13.8</td>
<td>3</td>
<td>-27.8</td>
</tr>
<tr>
<td>6c00513</td>
<td>64.5</td>
<td>11</td>
<td>-34.8</td>
</tr>
<tr>
<td>6c00517</td>
<td>-16.9</td>
<td>-7</td>
<td>12.1</td>
</tr>
<tr>
<td>6c00524</td>
<td>18.1</td>
<td>4</td>
<td>-68.4</td>
</tr>
<tr>
<td>6c00526</td>
<td>-7.6</td>
<td>-2</td>
<td>-24.4</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

Aerial Photography from 2018

South West Regional Coastal Monitoring Programme

Annual Survey Report 2021

6cSU30-4: Thurlestone - Beach Change

SDADCAG: South Devon
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion
-30 m²
-30 m²
-15 m²
-15 m²
-5 m²
-5 m²
No Change
Erosion
>30 m²
>30 m²
>30 m²
>30 m²
>30 m²
>30 m²

Aerial Photography from 2018
Background

Bantham consists of two profiles spanning a beach backed by an extensive dune system with an orientation of south-southwest, the eastern extent is confined by a rocky headland with the western extent split by the River Avon. The beach has a cross-shore length of ~480 m and longshore length of ~600 m with an average spring tidal range of 4.6 m.

Survey Unit Analysis

Analysis of the CPA for Bantham suggests the lowest recording was during the spring 2008 survey at 1512 m², since then there has been a gradual accretion in area with an accretion rate of 15.6 m² y⁻¹.

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU31-1, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Spring to spring analysis suggests profile 6c00574 has seen a movement of material from the upper beach face to the low tide terrace resulting in a gain of 14.2 m². Opposingly, profile 6c00577 has seen a loss of 36.1 m² primarily from the low tide terrace and lower beach face.

Baseline – Spring
Despite there being overall erosion observed in the spring to spring analysis, in comparison to 2007, both profiles have gained material. Profile 6c00574 has increased in area by 72.6 m², seeing the primary gains across the low tide terrace. Profile 6c00577 has increased in area by 105.5 m², again primarily increasing across the low tide terrace.

Complete dataset comparison (2007-2021)
When comparing to the entire dataset (Fig.2), both profiles are displaying relatively average cross-sectional area, despite that, both profiles ranges are high, suggesting an active beach. When comparing profile cross-sectional areas to the entire time series (Fig.3), both displayed gradual but sporadic accretion up until 2018, where both profiles have appeared to lose material.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU31-1.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25/02/2020 – 12/02/2021</td>
<td>15/06/2007 – 12/02/2021</td>
</tr>
<tr>
<td>6c00574</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td></td>
<td>14.2</td>
<td>2</td>
</tr>
<tr>
<td>6c00577</td>
<td>-36.1</td>
<td>-4</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
**Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)**

- **6c00577**: (-4%)
- **6c00574**: (2%)

**Survey Unit Boundary**

- **Accretion**: > 30 m²
- **No Change**: 15 - 30 m²
- **Erosion**: < 15 m²

**6cSU31-1: Bantham - Beach Change**

**SDADCAG: South Devon**

Aerial Photography from 2018
Aerial Photography from 2018

Survey Unit Boundary

Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

- Accretion
- No Change
- Erosion

Survey Unit Boundary

6c00577 (12%) 6c00574 (11%)
Background

Bigbury-on-Sea lies to the west of Bantham on the western side of the River Avon consisting of a tombolo formation, joining the mainland to Burgh Island with two beach faces to the west and east of the island. The beach has a cross-shore length of ~270 m and longshore length of ~400 m and a mean spring tidal range of 4.6 m. The beach consists of sand, backed by a rocky outcrop and the village of Bigbury.

Survey Unit Analysis

Analysis of the CPA indicates a relatively stable beach with an average area of ~2,440 m² (Table 1). The highest recorded area was during the spring interim survey of 2013 (2,503 m²) followed by the lowest area recorded during the spring survey of 2014 (2,388 m²). Overall Bigbury has shown an average accretion rate of 2.1 m² y⁻¹ (Table 1).

![Survey Unit 6cSU31-2 Combined Profile Area Chart](image)

**Figure 1** - The Combined Profile Area (CPA) for survey unit 6cSU31-2, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Spring to spring analysis suggests profile 6c00592 indicated the highest change with a 10% loss in cross-sectional area (Table 1), with the MLWS mark retreating by ~50 m. Profile 6c00596 saw a 49.6 m² (8%) increase in cross-sectional area, with material gains observed along the low-tide terrace. The tombolo profile (6c00603A), despite seeing a relatively minor change in CSA, saw a translation of the berm to the SE by around 50 m and a heightening of the berm by ~20 cm. Profile 6c00605 saw a 18.2 m² (4%) increase in cross-sectional area, across the low tide terrace, however saw a shortening of the MLWS mark by ~20 m.

Baseline - Spring
When comparing spring 2020 data to that of the 2007 baseline, all profiles have shown between 5-10% increase in cross-sectional area (Table 1). The tombolo profile (6c00603A), has shown the largest change, accreting by 10% (Table 1) with considerable accretion observed on the SE beach face.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), all profiles are relatively healthy, with 6c00603A indicating the highest cross-sectional area to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), all profiles have remained stable, with the exception of the 2016 spring interim, whereby 6c00592 saw a significant decrease in cross-sectional area, whereas 6c00596 and 6c00603A saw a comparative increase.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU31-2.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6c00592</td>
<td>-48.4</td>
<td>-10</td>
<td>23.2</td>
</tr>
<tr>
<td>6c00596</td>
<td>49.6</td>
<td>8</td>
<td>32.8</td>
</tr>
<tr>
<td>6c00603A</td>
<td>9.7</td>
<td>1</td>
<td>81.4</td>
</tr>
<tr>
<td>6c00605</td>
<td>18.2</td>
<td>4</td>
<td>33.3</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
**South West Regional Coastal Monitoring Programme**

**Annual Survey Report 2021**

**6cSU31-2: Bigbury-on-Sea - Beach Change**

**Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)**

- **Survey Unit Boundary**

**SDADCA: South Devon**

- **6c00592 (10%)**
- **6c00596 (8%)**
- **6c00605 (4%)**
- **6c00603A (1%)**

Aerial Photography from 2018
Aerial Photography from 2018

Survey Unit Boundary

Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Accretion
No Change
Erosion

> 30 m²
15 - 30 m²
5 - 15 m²
5 - 15 m²
> 30 m²

6c00605 (7%)
6c00603A (10%)
6c00036 (5%)
6c00032 (5%)
Background

Challaborough is a pocket beach confined by two rocky headlands with a southerly orientation backed by a series of sea defences which protect the village of Challaborough. The beach has a cross-shore distance of 150 m² and longshore distance of 360 m² and a mean spring tidal range of 4.6 m. The beach consists of sand forming a low-tide platform.

Survey Unit Analysis

Challaborough consists of only one profile, which has shown high variation in excess of 100 m², despite this the profile has remained relatively stable. The highest observed cross-sectional area was recorded during the 2012 spring interim (422 m²) with the lowest recorded during the 2016 spring interim (309 m²). The profile at Challaborough has displayed an erosion rate of 1.2 m² y⁻¹.

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU31-3, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
### Profile Analysis

#### Spring – Spring

Spring to spring analysis suggests profile 6c00619 has seen a loss of 12.8 m² (4%) and a change in morphology, with the reduction of material found along the low tide terrace and accretion on the upper beach face.

#### Baseline - Spring

Despite the observation of spring-spring analysis, when comparing the spring data to the 2007 baseline, profile 6c00619 has seen a gain of 33.8 m² (11%) in cross-sectional area. The beach morphology has again seen an increase in the beach face.

#### Complete Data Comparison (2007-2021)

When comparing to the entire dataset (Fig.2), the profile cross-sectional area is relatively average, with high variability observed since 2007.

#### Additional Comments

N/A

---

**Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU31-3.**

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10/03/2020 – 02/03/2021</td>
<td>01/09/2007 - 02/03/2021</td>
</tr>
<tr>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6c00619</td>
<td>-12.8</td>
<td>-4</td>
</tr>
<tr>
<td>Master Profile Level (m)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.**

---

**PLUMOUTH COASTAL OBSERVATORY**
**South West Regional Coastal Monitoring Programme**

**Annual Survey Report 2021**

---

**6cSU31-3: Challaborough - Beach Change**

**Survey Unit Boundary**

**Actual Change (m^2) in Cross-sectional Area**
(Spring 2020 to Spring 2021)

- **Accretion**
- **No Change**
- **Erosion**

---

**FLYMOUTH COASTAL OBSERVATORY**

Aerial Photography from 2018

---

**SDADCAG: South Devon**
South West Regional Coastal Monitoring Programme

Annual Survey Report 2021

Survey Unit Boundary

Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

6cSU31-3: Challaborough - Beach Change

SDADCA: South Devon

Aerial Photography from 2018

Accretion
No Change
Erosion

> 30 m²
15 - 30 m²
5 - 15 m²
< 5 m²

6c00619 (11%)

0 75 150

m
Background

Wembury beach consists of a thin veneer of gravel and sand atop a rocky platform facing south-southwest with a cross-shore length of 180 m and longshore length of 160 m and a mean spring tidal range of 4.7 m. The beach is flanked by rocky platforms and backed by an outcrop of glacial till.

Survey Unit Analysis

Wembury consists of only one profile, whose area has shown to be relatively stable with an erosion rate of 1.2 m² y⁻¹ since 2007. The lowest recorded area was during the spring interim survey of 2016 (310 m²) whereas the highest recorded area was during the 2012 spring interim survey (422 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU33, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Spring to spring analysis suggests a 28.5 m² (8%) decrease in cross-sectional area for profile 6c00992 (Table 1), primarily at the landward extent of the low-tide terrace. The 2021 profile has seen a 20 m retreat of the MLWS mark, reducing the width of the beach.

Baseline - Spring
When comparing the 2021 spring profile to that of the 2007 baseline, there has been a 25.3 m² (8%) increase in cross-sectional area for profile 6c00992. This increase can be primarily attributed to accretion along the upper section of the low tide terrace.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), profile 6c00992 recorded a below average cross-sectional area during the 2021 spring interim. The profile also shows to have a high fluctuation with a range of over 110 m² over the last 14 years.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU33.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master Profile Level (m)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6c00992</td>
<td>-28.5</td>
<td>-8</td>
</tr>
</tbody>
</table>

Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

- > 30 m²
- 15.1 - 30 m²
- 5 - 15 m²
- 5 - 15 m²
- > 30 m²

Accretion
No Change
Erosion

6cSU33: Wembury - Beach Change
SDADCAG: South Devon
Background

Kingsand Cawsand comprises two beaches, both facing east, protected from the predominant westerly wave climate by Rame Head. Kingsand has a cross-shore distance of 60 m and longshore distance of 210 m whereas Cawsand has a cross-shore distance of 70 m and longshore distance of 110 m, both beaches have a mean spring tidal range of 4.7 m. Both beaches comprise of sand and are backed by sea walls which defend the two villages from any incoming swell.

Survey Unit Analysis

Analysis of CPA suggests the survey unit has been gradually accreting since the 2007 baseline by 0.8 m² y⁻¹. The lowest recorded combined area was during the 2007 baseline (552 m²) whereas the highest combined area was during the 2015 spring interim survey (576 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6cSU38, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

**Spring – Spring**

When comparing spring 2020 data to spring 2021 data, all profiles showed minimal change in both cross-sectional area for both Cawsand (6c01304 and 6c01304A) and Kingsand profiles (6c01297 and 6c01299). Despite this, there was a distinguishable movement of material from the upper beach face to the lower beach face, with 6c01297 and 6c01304 showing a loss of >0.5 m from below the sea defence.

**Baseline - Spring**

When comparing spring 2021 data to that of the 2007 baseline, profiles 6c01297 and 6c01299 showed minimal change at -3% and 1% cross-sectional area changes respectively. Profiles 6c01304 and 6c01304A have accreted by 2% and 5% respectively in comparison to the 2007 baseline, with material gains across the entire beach face.

**Complete Data Comparison (2007-2021)**

When comparing to the entire dataset (Fig.2), profile 6c01304A recorded relatively high cross-sectional area in the 2021 spring interim, whereas profile 6c01297 recorded comparatively low area. When comparing profile cross-sectional areas to the entire time series (Fig.3), all profiles have remained stable since the 2007 baseline with the Cawsand (Kingsand) profiles accreting (eroding) gradually.

**Additional Comments**

N/A

---

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6cSU38.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Profile Cross-Sectional Area</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring to Spring</td>
<td>Baseline to Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10/02/2020 – 30/03/2021</td>
<td>15/06/2007 – 30/03/2021</td>
<td></td>
</tr>
<tr>
<td>6c01297</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>0.6</td>
<td>1</td>
<td>-3.3</td>
<td>-3</td>
</tr>
<tr>
<td>6c01299</td>
<td>-0.2</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td>6c01304</td>
<td>-4.3</td>
<td>-2</td>
<td>3.1</td>
</tr>
<tr>
<td>6c01304A</td>
<td>-0.9</td>
<td>0</td>
<td>10.4</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

- **6c01304**: (-2%)
- **6c01304A**: (0%)
- **6c01299**: (0%)
- **6c01297**: (1%)

CISCAG: South Cornwall

6cSU38: Kingsand & Cawsand - Beach Change
Background

Seaton Downderry combines two beach types; the former consists of a gravel/sand low tide terrace formation with a cross shore distance of ~150 m and longshore distance of ~300 m with the Seaton River mouth exiting to the westerly extent. Downderry consists of a reef platform backed by a sandy veneer and multiple private and local authority owned sea defences with a cross-shore distance of ~100 m and longshore distance of ~3,300 m. The beaches are orientated to the southwest, with a predominant south-westerly wave climate and mean spring tidal range of 4.8 m.

Survey Unit Analysis

Analysis of CPA at Seaton Downderry since 2007 suggests a highly dynamic beach fluctuating in excess of 450 m² (roughly 6% of the average CPA) with the lowest combined area recorded during the 2016 spring interim (6,906 m²) and the highest combined area during the 2013 spring interim (7,370 m²). Despite the highly dynamic nature of the beach, the accretion rate has remained relatively stable at 3.3 m² y⁻¹.

Profile Analysis

Spring – Spring

Comparison of spring to spring data suggests the majority of profiles have displayed a gain in cross-sectional area. The majority of the Downderry profiles: 6d00282 to 6d00317, showed varied change. Profiles 6d00296, 6d00310 and 6d00314 saw the largest loss of material, losing over 10% in cross-sectional area from the entire beach face (Table 1). In contrast, profiles 6d00298 and 6d00301...
saw a 5% and 15% increase in cross-sectional area respectively (Table 1) with material gains across the entire beach face.

The Seaton profiles (6d00318 to 6d00324) showed considerable accretion across most profiles (ranging from 1-12%) when compared to the 2020 spring data (Table 1). All Seaton profiles saw an increase in material across the lower beach face, with profiles 6d00319, 6d00320 and 6d00321 accreting by over 10 m seaward, indicating recovery from the previously low condition recorded in 2019.

Baseline - Spring

Comparison of the 2007 baseline to 2021 spring data showed the majority of profiles have accreted (Table 1). The Downderry profiles showed minimal change, ranging from a 2% to 7% increase in material.

The Seaton profiles saw an increase in material ranging from 3% to 11%, with the beach face advancing by between 10-15 m for profiles 6d000319 to 6d00322. The only profiles to have shown a comparative loss in cross-sectional area when comparing to the 2007 baseline are 6d00321 and 6d00323, with the latter losing over 23 m² primarily from the lower beach face, attributable to the changing course of the river Seaton.

Complete Data Comparison (2007-2021)

When comparing to the entire dataset (Fig.2), the Downderry profiles from 6d00282 to 6d00310 show a much-reduced range, primarily due to the shortened beach face, protected by the rocky platform. In contrast the Seaton profiles have shown much higher variance (Fig.2). Profile 6d00301 recorded its highest cross-sectional area to date during the 2021 spring interim, whereas profile 6d00321 recorded its second highest cross-section area (Fig.2). When comparing profile cross-sectional areas to the entire time series (Fig.3), all profiles have displayed varied temporal responses, with the primary erosion events recorded during the 2013/14 winter apparent in 6d00301, 6d00306, 6d00319 and 6d00320.

Additional Comments

*Profiles 6d00286 to 6d00290 were added to the programme at the beginning of phase two, baseline data was extracted from LiDAR captured in February 2008.

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D1-4.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Cross-Sectional Area</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12/03/2020 - 15/03/2021</td>
<td>18/03/2007 - 15/03/2021</td>
<td></td>
</tr>
<tr>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d00282</td>
<td>-3.0</td>
<td>-1</td>
<td>8.7</td>
</tr>
<tr>
<td>6d00286*</td>
<td>-4.5</td>
<td>-1</td>
<td>9.1</td>
</tr>
<tr>
<td>6d00290*</td>
<td>-5.0</td>
<td>-1</td>
<td>14.1</td>
</tr>
<tr>
<td>6d00296</td>
<td>-30.9</td>
<td>-10</td>
<td>4.2</td>
</tr>
<tr>
<td>6d00298</td>
<td>15.6</td>
<td>5</td>
<td>11.5</td>
</tr>
<tr>
<td>6d00301</td>
<td>44.4</td>
<td>15</td>
<td>22.0</td>
</tr>
<tr>
<td>6d00306</td>
<td>-3.1</td>
<td>-2</td>
<td>3.7</td>
</tr>
<tr>
<td>6d00310</td>
<td>-25.7</td>
<td>-12</td>
<td>5.8</td>
</tr>
<tr>
<td>6d00314</td>
<td>-37.6</td>
<td>-16</td>
<td>-3.1</td>
</tr>
<tr>
<td>6d00317</td>
<td>1.6</td>
<td>0</td>
<td>14.8</td>
</tr>
<tr>
<td>6d00318</td>
<td>21.2</td>
<td>4</td>
<td>39.5</td>
</tr>
<tr>
<td>6d00319</td>
<td>58.2</td>
<td>10</td>
<td>24.2</td>
</tr>
<tr>
<td>6d00320</td>
<td>79.2</td>
<td>11</td>
<td>21.8</td>
</tr>
<tr>
<td>6d00321</td>
<td>7.2</td>
<td>1</td>
<td>-11.9</td>
</tr>
<tr>
<td>6d00322</td>
<td>50.2</td>
<td>12</td>
<td>43.5</td>
</tr>
<tr>
<td>6d00323</td>
<td>10.8</td>
<td>3</td>
<td>-23.2</td>
</tr>
<tr>
<td>6d00324</td>
<td>15.8</td>
<td>4</td>
<td>25.2</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3a - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Figure 3b - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.

Figure 3c - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Figure 3d - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

- Accretion
- No Change
- Erosion

Survey Unit Boundary

6d6D1-4: Seaton & Downderry - Beach Change

CISCAG: South Cornwall
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion

No Change

Erosion

> 30 m²

15 - 30 m²

5 - 15 m²

< 5 m²

15 - 30 m²

> 30 m²

6d6D1-4: Seaton & Downderry - Beach Change

CISCAG: South Cornwall
Profiles: 6d00322

Start Point to Lizard Point Annual Report 2021
Background

Looe consists of two beach sections. Looe beach is sandy and dissipative, backed by a series of sea walls with a breakwater to the southern extent and rocky outcrop to the north with a cross-shore distance of ~190 m and longshore distance of ~270 m. Millendreath consists of a sandy veneer at the upper beach face, protected by a rocky reef platform with a sandy beach to the northern extent, similar to that of Looe with a cross-shore distance of ~120 m and longshore distance of ~1300 m. The survey unit faces southeast with a mean spring tidal range of 4.8 m.

Survey Unit Analysis

Analysis of the CPA suggests the survey unit has been continually accreting by 9 m$^2$ y$^{-1}$ since the baseline in 2007 (Fig.1). The lowest recorded combined area was during the 2008 spring interim survey with the highest recorded during the recent 2021 spring interim survey.

![Survey Unit 6d6D1-6 Combined Profile Area Chart](image)

*Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D1-6, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.*
Profile Analysis

Spring – Spring

When comparing spring 2020 data to the recent 2021 spring data, all profiles have remained relatively stable, showing <±2% in cross sectional area (Table 1).

Baseline – Spring

When comparing 2021 spring data to the baseline survey of 2007, all profiles have accreted by 0-13%. Profile 6d00396 at Millendreath Beach has accreted by 9%, equating to a 29.7 m² gain, primarily across the upper beach face and directly adjacent to the sea defence. The three profiles on Looe Beach (6d00425, 6d00427 and 6d00429) saw the highest percentage increase in cross-sectional area ranging from 9% to 13%, with accretion across the entire beach face at each.

Complete Data Comparison (2007-2021)

When comparing to the entire dataset (Fig.2), during the 2021 spring interim all profiles were relatively healthy with 6d00427 and 6d00429 displaying the highest cross-sectional area to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), the three Looe Beach profiles have displayed continual accretion since 2007 with minimal seasonal variation apparent in any profile.

Additional Comments

N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D1-6.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12/02/2020 – 14/01/2021</td>
<td>18/03/2007 – 14/01/2021</td>
<td>Level (m)</td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6d00396</td>
<td>7.0</td>
<td>2</td>
<td>29.7</td>
</tr>
<tr>
<td>6d00402</td>
<td>-3.6</td>
<td>-2</td>
<td>3.8</td>
</tr>
<tr>
<td>6d00410</td>
<td>38.5</td>
<td>45</td>
<td>-0.3</td>
</tr>
<tr>
<td>6d00414</td>
<td>0.3</td>
<td>0</td>
<td>5.3</td>
</tr>
<tr>
<td>6d00425</td>
<td>-3.9</td>
<td>-2</td>
<td>28.0</td>
</tr>
<tr>
<td>6d00427</td>
<td>7.2</td>
<td>2</td>
<td>40.2</td>
</tr>
<tr>
<td>6d00429</td>
<td>0.6</td>
<td>0</td>
<td>38.1</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3a - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Figure 3b - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change ($m^2$) in Cross-sectional Area (Spring 2020 to Spring 2021)

- **Survey Unit Boundary**

<table>
<thead>
<tr>
<th>Change (m²)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 30 m²</td>
<td>2%</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>0%</td>
</tr>
<tr>
<td>5 - 15 m²</td>
<td>45%</td>
</tr>
<tr>
<td>&lt; 5 m²</td>
<td>0%</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>0%</td>
</tr>
<tr>
<td>&gt; 30 m²</td>
<td>-2%</td>
</tr>
<tr>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

**6d6D1-6: Looe - Beach Change**

CISCAG: South Cornwall
Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

<table>
<thead>
<tr>
<th>Survey Unit</th>
<th>Change ($m^2$)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>6d00427</td>
<td>5 - 15 m$^2$</td>
<td>9%</td>
</tr>
<tr>
<td>6d00429</td>
<td>5 - 15 m$^2$</td>
<td>9%</td>
</tr>
<tr>
<td>6d00414</td>
<td>&gt; 30 m$^2$</td>
<td>4%</td>
</tr>
<tr>
<td>6d00410</td>
<td>No Change</td>
<td>0%</td>
</tr>
<tr>
<td>6d00402</td>
<td>5 - 15 m$^2$</td>
<td>2%</td>
</tr>
<tr>
<td>6d00429</td>
<td>&gt; 30 m$^2$</td>
<td>9%</td>
</tr>
</tbody>
</table>

Aerial Photography from 2018
Background

Talland Bay is a small pocket beach consisting of a sandy veneer atop a rocky platform backing onto a through road and facing south with a cross-shore distance of 190 m and longshore distance of 130 m. The beach has a mean spring tidal level of 4.8 m.

Survey Unit Analysis

Analysis of the CPA indicates a relatively stable beach, with an accretion rate of 0.1 m$^2$ y$^{-1}$. The highest recorded combined area was during the 2013 autumn interim (680 m$^2$) however, the survey unit was heavily impacted by the 2013/14 winter storm season, with the lowest combined area recorded during the 2014 spring interim (540 m$^2$), having lost 140 m$^2$.

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D1-8, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring - Spring
When comparing spring 2020 data to the recent 2021 spring data, both profiles have remained accreted. Profile 6d00527 and 6d00528 saw a 7% and 9% increase in cross-sectional area respectively, with both profiles accreting across the low-tide terrace (Table 1).

Baseline - Spring
When comparing 2021 spring data to the baseline survey of 2007, both profiles have accreted. Profile 6d00527 and 6d00528 saw a 10% and 8% increase in cross-sectional area respectively, again accreting across the low-tide terrace (Table 1).

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim both profiles are relatively accreted as is displayed in figure 1. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles have displayed relatively high fluctuations in material, with both showing considerable loss during the 2013/14 storm period.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D1-8.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Profile Cross-Sectional Area</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring to Spring</td>
<td>Baseline to Spring</td>
</tr>
<tr>
<td></td>
<td>26/02/2020 - 14/01/2021</td>
<td>21/03/2007 - 14/01/2021</td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²) % Change</td>
<td>CSA Diff (m²) % Change</td>
</tr>
<tr>
<td>6d00527</td>
<td>22.6 7</td>
<td>30.0 10</td>
</tr>
<tr>
<td>6d00528</td>
<td>26.9 9</td>
<td>23.5 8</td>
</tr>
</tbody>
</table>

N/A
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

Accretion
Erosion
No Change

> 30 m²
15 - 30 m²
5 - 15 m²
5 - 15 m²
15 - 30 m²
> 30 m²

6d6D1-8 Talland - Beach Change

CISCAG: South Cornwall

Aerial Photography from 2018
Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

- **Survey Unit Boundary**

### Changes

- **Accretion**
  - > 30 m²: 2
  - 15 - 30 m²: 2
  - 5 - 15 m²: 2
- **Erosion**
  - < 5 m²: 2
  - 5 - 15 m²: 2
  - 15 - 30 m²: 2
  - > 30 m²: 8

---

**6d6D1-8 Talland - Beach Change**

**CISCAG: South Cornwall**
Background

Par Sands is a south facing large sandy beach backed by an accreting dune system and confined by a small stream and Par docks to the west and Gribbin Head to the east. The beach has a cross-shore distance of ~800 m and longshore distance of ~650 m with an average spring tidal range of 4.5 m.

Survey Unit Analysis

Analysis of the CPA indicates the survey unit has been accreting at 30.8 m² y⁻¹ equating to 0.6% of the average beach area per year. The lowest recorded combined area was during the 2014 spring interim, following the highly energetic winter period, however the beach had recovered by the following year. The highest recorded combined area was during the latest spring interim (5,388 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D2-4, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring

When comparing the 2021 spring data to that of 2020, all profiles for 6d6D2-4 showed minimal percentage change in cross-sectional area and morphology (Table 1).

Baseline - Spring

In comparison to the baseline of 2007, all 2021 spring profiles have indicated a considerable gain in material similar to that of previous years. A maximum accretion of 202.7 m², equating to a 22% increase in cross-sectional area, was observed for profile 6d00965 (Table 1). Increases were primarily observed toward the top of all profiles, highlighting the accreting dune system. A widening of the beach has been observed for profiles 6d00960 and 6d00965.

Complete Data Comparison (2007-2021)

When comparing to the entire dataset (Fig.2), during the 2021 spring interim all profiles were relatively very healthy with 6d00956 and 6d00965 displaying the highest cross-sectional area to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), all profiles again have displayed continual accretion since 2007 with minimal seasonal variation apparent in any profile. Profile 6d00956 was the only one to indicate a real erosive impact from the 2013/14 winter season (Fig.3).

Additional Comments

N/A

<table>
<thead>
<tr>
<th>Profile</th>
<th>Cross-Sectional Area Change</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6d00952</td>
<td>21.9</td>
<td>12</td>
</tr>
<tr>
<td>6d00956</td>
<td>27.9</td>
<td>11</td>
</tr>
<tr>
<td>6d00960</td>
<td>-14.9</td>
<td>16</td>
</tr>
<tr>
<td>6d00965</td>
<td>9.7</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D2-4.
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
South West Regional Coastal Monitoring Programme

Annual Survey Report 2021

6d6D2-4: Par Sands - Beach Change

Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

CISCAG: South Cornwall
**Actual Change (m^2) in Cross-sectional Area**
(Baseline 2007 to Spring 2021)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Actual Change (m^2) in Cross-sectional Area (Baseline 2007 to Spring 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 30 m^2 (22%)</td>
</tr>
<tr>
<td></td>
<td>15 - 30 m^2 (11%)</td>
</tr>
<tr>
<td></td>
<td>5 - 15 m^2 (11%)</td>
</tr>
<tr>
<td></td>
<td>&lt;= 5 m^2 (12%)</td>
</tr>
</tbody>
</table>

**Survey Unit Boundary**

**Accretion**

**Erosion**

**No Change**

Aerial Photography from 2018
Background

Carlyon Bay is a southerly facing large sandy beach backed by a steep cliff face which has historically gained sediment from the china clay works from Par Docks. The beach is steep and reflective, with an average cross-shore distance of 120 m, longshore distance of 1300 m and mean spring tidal range of 4.5 m. The beach experiences rotation based on a bimodal wave climate of predominant south-westerly swell direction with a secondary south-easterly direction.

Survey Unit Analysis

Analysis of the CPA suggests a relatively stable beach with minimal seasonal variation from 2007 to 2014. Following 2014, the seasonal variation becomes considerably more apparent with the lowest combined area recorded in the most recent spring interim (1,020 m²) and the highest recorded during the 2015 spring interim (1,137 m²). The beach has shown an erosion rate of 2.8 m² y⁻¹ since the baseline in 2007.

Repeat Baseline Analysis

Analysis of beach volume throughout the duration of the Programme has shown volumes to fluctuate between 2007 and 2021 with the overall trend showing a small decrease in beach volume (Fig. 1). The lowest recorded volume (235,750 m³) was during the 2010 baseline, whereas the highest was during the baseline survey in 2016 (258,544 m³); see Fig. 1.
Analysis of the topographic difference model between the 2020 and 2021 baseline data, unlike last year, does not show a clear representation of erosion or accretion dominating a particular region of the survey unit. Erosion dominates the survey unit, with high level erosion occurring towards the lower beach face west of profile 6d1022 and at the back of the beach by profile 6d01006. Accretion is present mainly towards the lower beach with higher levels near the eastern and western boundaries of the unit. There was an overall loss of 12,228 m³ in volume above the MLWS mark equating to a net sediment decrease of 1.9%.

**Net sediment balance above MLWS**
-12,228 m³

**Net sediment change**
-1.9%

Analysis of the topographic difference model between the 2021 and 2007 baseline suggests an east to west rotation of the beach. Significant erosion is observed to the east of the beach, supplemented by accretion to the west; it should be noted that the river channel has changed course significantly influencing the erosion observed at the upper beach face between profiles 6d01014 and 6d01010 with subsequent accretion observed across the lower face along the centre of the beach. Some erosion is observed to the leeward side of the rock formation at the west of the beach. Overall, 14,719 m³ of material has eroded from above the MLWS mark, equating to a 4.9% loss in volume in comparison to 2007 levels.

**Net sediment balance above MLWS**
-14,719 m³

**Net sediment change**
-4.9%

**Profile Analysis**

**Spring – Spring**
When comparing the 2021 spring data to the 2020 spring data, the majority of profiles indicated minor accretion. The only profiles to display considerable erosion where 6d01006 and 6d1026, losing 6% and 17% respectively (Table 1), the former can be attributed partially to the movement of the riverbed whereas the latter has seen a loss of material from across the entire beach face, resulting in a ~10 m retreat of the MLWS mark.

**Baseline - Spring**
When comparing the 2021 spring data to the 2007 baseline, the majority of profiles have undergone erosion (Table 1). Profiles 6d01006 and 6d01010 have seen an 8% and 4% loss in cross-sectional area respectively, primarily attributable to the movement of the river across the upper beach face. Profile 6d01026 saw the highest change, losing 30% in cross-sectional area, equating to a 57.3 m² loss in material from across the entire beach face.

**Complete Data Comparison (2007-2021)**
When comparing to the entire dataset (Fig.2), during the 2021 spring interim all profiles were relatively low with respect to cross-sectional area, however none indicated their lowest ever level. When comparing profile cross-sectional areas to the entire time series (Fig.3) the central profiles 6d01014 and 6d01018 have remained relatively stable. The remaining profiles highlight the rotational nature of the beach with 6d01006 and 6d01010 indicating a gain of material during the 2013/14 winter period, compensated by a gain of material observed for profiles 6d01022 and 6d01026. The opposite occurred during the recent 2020/22 winter period (Fig.3).

**Additional Comments**
Significant works have been carried out at this location over the last few years and as such profiles have changed in shape and length significantly. It is advised that the profile charts are consulted before making any further decisions based on these analyses.
Table 1 - Cross-sectional area change in m² and percentage comparing Spring to Spring and baseline to Spring analysis for all profiles in survey unit 6d6S2-7.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>08/02/2020 - 11/01/2021</td>
<td>18/03/2007 – 11/01/2021</td>
<td></td>
</tr>
<tr>
<td>Level (m)</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>6d01006</td>
<td>-23.9</td>
<td>-6</td>
<td>-31.6</td>
</tr>
<tr>
<td>6d01010</td>
<td>17.9</td>
<td>7</td>
<td>-13.5</td>
</tr>
<tr>
<td>6d01014</td>
<td>9.4</td>
<td>8</td>
<td>8.0</td>
</tr>
<tr>
<td>6d01018</td>
<td>-0.3</td>
<td>-1</td>
<td>-2.0</td>
</tr>
<tr>
<td>6d01022</td>
<td>6.7</td>
<td>9</td>
<td>5.2</td>
</tr>
<tr>
<td>6d01026</td>
<td>-28.4</td>
<td>-17</td>
<td>-57.3</td>
</tr>
<tr>
<td>6d01006</td>
<td>-23.9</td>
<td>-6</td>
<td>-31.6</td>
</tr>
</tbody>
</table>

Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.
Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area
(Spring 2020 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

> 30 m²
16 - 30 m²
5 - 15 m²
< 5 m²
15 - 30 m²
> 30 m²
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

> 30 m²
15 - 30 m²
5 - 15 m²
5 - 15 m²
15 - 30 m²
> 30 m²

6d01014  (7%)
6d01018  (-4%)
6d01010  (-4%)
6d01022  (7%)
6d01006  (-8%)
6d01026  (-30%)
Change in Elevation (m) Between May 2020 and May 2021

Model Extent

- Erosion
- No Change
- Accretion

Aerial Photography from 2018

0 125 250 m

South West Regional Coastal Monitoring Programme

Annual Survey Report 2021
Sediment Type
- Gravel
- Gravel & Sand
- Sand
- Boulder
- Dune
- Dune Vegetated
- Grass
- Gravel & Mud
- Mud
- Mud & Sand
- Rock
- Saltmarsh
- Sea Defence
- Shell
- Water Body
- Mixture
- Obstruction
Profiles: 6d01006

Start Point to Lizard Point Annual Report 2021

Profile Charts for Survey Unit 6d0D2-7
Profile Charts for Survey Unit 6d0D2-7

Profiles: 6d01026

Start Point to Lizard Point Annual Report 2021

Level (m)

Chainage (m)

-2.5 -2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5

140 160 180 200 220 240 260 280

2021-01-11  2020-02-08  2007-03-18  Master Profile  Profile Envelope
Background

Pentewan Sands is an east facing beach backed by a caravan park and confined by two rocky headlands to the north and south. The sandy beach consists of a low tide terrace with a cross-shore length of 200 m and longshore length of 820 m and mean spring tidal range of 4.5 m. The beach has a predominantly easterly wave climate.

Survey Unit Analysis

Analysis of the CPA indicates that Pentewan has shown a gradual erosion of 4.9 m² y⁻¹ equating to 0.2% of area per year. The lowest combined area was recorded during the 2016 spring interim (2,331 m²) with the highest recorded the following year during the 2017 spring interim (2,544 m²). Profile 6d01220A was not included during this analysis, as it was only added to the programme in 2015.

![Graph of Combined Profile Area](image)

*Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D2-13, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.*
Profile Analysis

Spring – Spring
When comparing spring 2021 to spring 2020 data, there has been a similar trend to previous years, with profiles 6d01219 and 6d01220A seeing a 12% and 3% increase in cross-sectional area respectively (Table 1), with an increase in material across the lower beach face. Profile 6d01221 saw a 7% loss in cross-sectional area (Table 1) with material gains across the low tide terrace. Profiles 6d01225 and 6d01233 showed minimal changes whereas 6d01229 saw a 60.9 m² (10%) gain in cross-sectional area (Table 1) primarily across the low tide terrace.

Baseline - Spring
When comparing spring 2021 data to the 2007 baseline, profile 6d01219 saw a 26.1 m² (6%) loss in cross-sectional area (Table 1), primarily from across the low-tide terrace. Profile 6d01220A has seen a 45.4 m² (3%) gain in cross-sectional area (Table 1) with the formation of a berm at around -0.5 ODN. Profiles 6d01221 to 6d01229 are comparatively stable, whereas 6d01233 has seen a 22.7 m² (5%) loss in cross-sectional area (Table 1) with the upper beach face retreating by ~8 m.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim all profiles were relatively healthy with 6d00427 and 6d00429 displaying the highest cross-sectional area to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), the three Looe Beach profiles have displayed continual accretion since 2007 with minimal seasonal variation apparent in any profile.

Additional Comments
Profile 6d01220A was added after the 2014 storm period. Data for this profile for 2007 was therefore extracted from LiDAR.

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D2-13.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>14/01/2020 – 13/01/2021</td>
<td>22/03/2007 - 13/01/2021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6d01219</td>
<td>44.3</td>
<td>12</td>
<td>-26.1</td>
</tr>
<tr>
<td>6d01220A</td>
<td>44.8</td>
<td>3</td>
<td>45.4</td>
</tr>
<tr>
<td>6d01221</td>
<td>-36.8</td>
<td>-7</td>
<td>6.1</td>
</tr>
<tr>
<td>6d01225</td>
<td>10.8</td>
<td>2</td>
<td>-14.2</td>
</tr>
<tr>
<td>6d01229</td>
<td>60.9</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>6d01233</td>
<td>-4.5</td>
<td>-1</td>
<td>-22.7</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

> 30 m²
15 - 30 m²
< 15 m²
15 - 30 m²
> 30 m²

6d01220A (3%)
6d01221 (-7%)
6d01225 (10%)
6d01229 (-1%)
6d01233 (2%)
Aerial Photography from 2018

Survey Unit Boundary

Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Accretion  No Change  Erosion

> 30 m²  15 - 30 m²  5 - 15 m²  5 - 15 m²  5 - 15 m²  > 30 m²

6d01221A (1%)  6d01225 (3%)  6d01222 (1%)  6d01229 (-5%)  6d01233 (-3%)  6d01220A (3%)
Background

Portmellon is a northeast facing pocket beach backed by a sea wall protecting a through road and confined by two rocky outcrops to the northwest and southeast. The beach has a cross-shore length of 170 m and longshore distance of 120 m with a mean spring tidal range of 4.5 m.

Survey Unit Analysis

Portmellon Beach has only one profile which has shown gradual accretion since the 2007 baseline equivalent to an increase of 1.1 m² y⁻¹ or a 0.7% gain per year (Fig.1). The lowest recorded combined area was from the 2009 spring interim survey (130.6 m²) and the highest recorded combined area was during the 2017 summer baseline (159.9 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D2-15, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

**Spring – Spring**
When comparing spring 2021 to spring 2020 data, profile 6d01291 has seen an increase in cross-sectional area by 6.1 m² (4%), primarily at the lower beach face before the low-tide terrace (Table 1).

**Baseline - Spring**
In comparison to the 2007 baseline data, profile 6d01291 has seen an increase in material by 13 m² (9%), with accretion observed across the upper low tide terrace and upper beach face.

**Complete Data Comparison (2007-2021)**
When comparing to the entire dataset (Fig.2), during the 2021 spring interim profile 6d01291 indicated a very healthy cross-sectional area.

**Additional Comments**
N/A

*Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D2-15.*

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14/01/2020 – 11/01/2021</td>
<td>21/03/2007 – 11/01/2021</td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d01291</td>
<td>6.1</td>
<td>4</td>
</tr>
</tbody>
</table>

*Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.*
Actual Change (m²) in Cross-sectional Area
(Spring 2020 to Spring 2021)

Survey Unit Boundary

6d01291 (4%)

Accretion
Erosion
No Change

> 30 m²
15 - 30 m²
5 - 15 m²
5 - 15 m²
15 - 30 m²
> 30 m²

Aerial Photography from 2018

6d6D2-15: Portmellon Beach - Beach Change
CISCAG: South Cornwall
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion | No Change | Erosion

> 30 m² | 15 - 30 m² | < 5 m² | 5 - 15 m² | 15 - 30 m² | > 30 m²

6d01291 (9%)
Background

Gorran Haven is a dissipative, east facing sandy beach comprising of two pocket beaches backing onto a cliff and sea defence separated at high tide by a rocky outcrop, confined by a rocky cliff face to the north and breakwater to the south. The beach has a cross-shore distance of ~170 m and longshore distance of ~120 m with a spring tidal range of 4.5 m. The primary wave direction is from the south-east.

Survey Unit Analysis

Analysis of the CPA timeseries suggests Gorran Haven has remained relatively stable. Despite fluctuating by up to 40 m² (equating to 7.7% of the average combined area), there was minimal fluctuation in combined area from 2007 to 2013 (Fig.1), suggesting seasonal fluctuation has recently increased. The lowest combined area was recorded during the 2013 autumn interim; 480 m², with the highest recorded during the 2015 autumn survey; 553.9 m² (Fig.1).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D2-17, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring

When comparing 2020 spring data to 2021 spring data, profile 6d01374 saw a significant increase in material, accreting by 26.6 m$^2$ across the entire beach face (Table 1). Despite a minimal increase in cross-sectional area (1.9 m$^2$), profile 6d01377 has seen a movement of material from the upper beach face to the MLWS mark (Table 1).

Baseline - Spring

In comparison to the 2007 baseline survey, profile 6d01374 has seen a 23.5 m$^2$ (8%) increase in cross-sectional area (Table 1) across the entire beach face. Profile 6d01377 has seen a 1.6 m$^2$ loss in material (Table 1), primarily from directly beneath the sea defence.

Complete Data Comparison (2007-2021)

When comparing to the entire dataset (Fig.2), during the 2021 spring interim were relatively healthy, with 6d01377 falling on the lower half of the range. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles have remained fairly stable, with 6d01374 indicating greater seasonal variability.

Additional Comments

*LiDAR data from January 2008 was used to provide a baseline comparison for profile 6d01374.

Table 1 - Cross-sectional area change in m$^2$ and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D2-17.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Profile Cross-Sectional Area</th>
<th>Master Profile Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring to Spring 14/01/2020 – 11/01/2021</td>
<td>Baseline to Spring 22/03/2007 - 11/01/2021</td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m$^2$)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d01374*</td>
<td>26.6</td>
<td>9</td>
</tr>
<tr>
<td>6d01377</td>
<td>1.9</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

Accretion | No Change | Erosion

> 30 m² | 15 - 30 m² | 5 - 15 m² | < 5 m² | 15 - 30 m² | > 30 m²

6d01374 (9%)
6d01377 (1%)
Aerial Photography from 2018

Survey Unit Boundary

Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

- 6d01374 (8%)
- 6d01377 (-1%)

No Change
Accretion
Erosion

C I S C A G: S o u t h C o r n w a l l

P L Y M O U T H C O A S T A L O B S E R V A T O R Y

Aerial Photography from 2018

6d6D2-17: Gorran Haven - Beach Change
Background

Hemmick is a southwest facing dissipative sandy beach backed by a conglomerate cliff face and grassy fields and confined by a rocky outcrop to the southeast and rocky platform to the northwest. The beach has a cross-shore distance of 120 m and longshore distance of 230 m with a spring tidal range of 4.5 m.

Survey Unit Analysis

Hemmick consists of only one profile which has been relatively stable since 2007 showing high seasonal variation, equating to a 1 m² y⁻¹ loss of area since 2007. The lowest recorded combined area was during the 2014 spring interim (369.3 m²) with the highest recorded during the 2010 autumn interim (445.9 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D3-2, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

**Spring – Spring**  Spring to spring analysis for profile 6d01477 indicated a 8.8 m² (2%) gain in cross-sectional area (Table 1), with material moving from the upper beach face to the lower, extending the MLWS mark seawards by ~15 m.

**Baseline - Spring**  When comparing to the 2007 baseline, profile 6d01477 has shown a 20.7 m² (5%) increase in cross-sectional area, again with material accreting along the low tide terrace near the MLWS mark.

**Complete Data Comparison (2007-2021)**  When comparing to the entire dataset (Fig.2), profile 6d01477 displayed relatively low cross-sectional area during the 2021 spring interim.

**Additional Comments**  N/A

---

**Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D3-2.**

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d01477</td>
<td>8.8</td>
<td>2</td>
</tr>
</tbody>
</table>

**Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.**
**Actual Change (m²) in Cross-sectional Area**
(Spring 2020 to Spring 2021)

- **Survey Unit Boundary**

<table>
<thead>
<tr>
<th>Actual Change</th>
<th>Cross-sectional Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 30 m²</td>
<td>Accuracy</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>No Change</td>
</tr>
<tr>
<td>5 - 15 m²</td>
<td>Erosion</td>
</tr>
<tr>
<td>&lt; 5 m²</td>
<td></td>
</tr>
</tbody>
</table>

**FLYINGCOASTAL OBSERVATORY**
Aerial Photography from 2018

**6d6D3-2: Hemmick Beach - Beach Change**

**CISAG: South Cornwall**
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

6d6D3-2: Hemmick Beach - Beach Change

CISCAG: South Cornwall

Aerial Photography from 2018
Background

Porthluney Cove is a south facing dissipative, pocket beach backed by a small dune system and fresh water pond, confined by rocky cliffs to the east and west. The beach has a cross-shore distance of ~280 m and longshore distance of ~340 m with a spring tidal range of 4.5 m. The beach has a south westerly wave climate.

Survey Unit Analysis

Analysis of the CPA suggests Porthluney Cove is relatively stable, accreting by 2.6 m² y⁻¹ since the 2007 baseline (Fig.1). The highest rate of change was observed between the 2013 autumn interim and the 2014 spring interim, losing 149 m² (equating to 15% of the average area). The 2014 spring interim also saw the lowest recorded combined area (830 m²) with the highest recorded during the 2011 autumn interim (1070 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D3-4, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Analysis of spring to spring surveys indicated profile 6d01526 saw a 24 m² (4%) loss in cross-sectional area (Table 1), primarily from the low-tide terrace. In comparison, profile 6d01528 saw a 26.5 m² (6%) increase in cross-sectional area, with accretion observed across the upper beach face (Table 1).

Baseline - Spring
When comparing the 2021 spring data to the 2007 baseline, profiles 6d01526 and 6d01528 have seen a 34.9 m² (7%) and 57.4 m² (15%) increase in cross-sectional area (Table 1). The increase in material can be attributable to gains across the lower beach face.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim profile 6d01528 displayed comparatively high cross-sectional area while 6d01526 was of average levels. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles have remained relatively stable with the only observable decrease in cross-sectional area attributable to the 2013/14 winter period.

Additional Comments
N/A

<table>
<thead>
<tr>
<th>Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D3-4.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profile Cross-Sectional Area</strong></td>
</tr>
<tr>
<td><strong>Profile</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>6d01526</td>
</tr>
<tr>
<td>6d01528</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

- > 30 m² (14%)
- 15 - 30 m² (18%)
- 5 - 15 m² (9%)
- 5 - 15 m² (21%)
- > 30 m² (14%)

6d6D3-4: Porthluney Cove - Beach Change

CISCAG: South Cornwall
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

- **Accretion**
- **Erosion**
- **No Change**

**6d6D3-4: Porthluney Cove - Beach Change**

**CISCAG: South Cornwall**

Aerial Photography from 2018
Background

Portholland is a south facing dissipative beach backed by a rocky cliff face and two small hamlets with sea defences; the beach is confined by two rocky headlands. The cross-shore distance is 140 m and longshore distance is 320 m, while the beach has a spring tidal range of 4.5 m.

Survey Unit Analysis

Analysis of the CPA suggests the beach is relatively stable, accreting at a rate of 0.8 m² y⁻¹ since the 2007 baseline. The highest loss in combined area was observed following the 2013/14 winter losing 52 m² from the 2013 autumn interim to the 2014 spring interim. The lowest recorded combined area was during the 2015 spring interim (370 m²), whereas the highest recorded was during the 2011 autumn interim (495 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D3-6, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
When comparing spring 2020 to spring 2021 surveys, both profiles have indicated minimal accretion of material with 6d01556 and 6d01561 gaining 4% and 3% in cross-sectional area respectively (Table 1).

Baseline - Spring
In comparison to the 2007 baseline, there has been limited change in both profiles with 6d01556 and 6d01561 gaining 1.8 m² (1%) and 3.6 m² (2%) respectively (Table 1). Both profiles have seen a loss of material from the upper beach face and gain of material across the lower beach face.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim all profiles were relatively healthy. When comparing profile cross-sectional areas to the entire time series (Fig.3), profile 6d01561 has remained relatively stable whereas profile 6d01556 indicated a significant drop in cross-sectional area between the winter of 2013 and 2015, followed by a subsequent recovery until spring 2017.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D3-6.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15/01/2020 – 12/01/2021</td>
<td>14/07/2007 - 12/01/2021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6d01556</td>
<td>9.9</td>
<td>4</td>
<td>1.8</td>
</tr>
<tr>
<td>6d01561</td>
<td>5.4</td>
<td>3</td>
<td>3.6</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m$^2$) in Cross-sectional Area (Spring 2020 to Spring 2021)

- 6d01561 (3%)
- 6d01556 (4%)

Survey Unit Boundary

Accretion | No Change | Erosion

> 30 m$^2$ | 15 - 30 m$^2$ | < 15 m$^2$

- (4%)
- (3%)

CISCAG: South Cornwall
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

- 5 - 15 m²
- > 30 m²
- 15 - 30 m²
- < 5 m²
- > 30 m²

Survey Unit Boundary

Accretion
No Change
Erosion

Aerial Photography from 2018
Background

Carne is a southeast facing, sandy, low tide terrace backed by a consolidated rocky cliff face with several properties atop, the beach is confined by a rocky platform to the southwest and rocky headland to the northeast. The beach has a cross-shore distance of 200 m and a longshore distance of 1,200 m with an average spring tidal range of 4.5 m.

Survey Unit Analysis

Analysis of the CPA suggests the beach has undergone a gradual accretion rate of 1.1 m² y⁻¹ since the 2007 baseline (Fig.1). The lowest recorded combined area was during the 2007 baseline (1,703 m²) whereas the highest recording was during the 2011 autumn interim (1,940 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D3-10, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring

When comparing spring 2020 to spring 2021 data, profiles 6d01746 to 6d01754, displayed limited change in cross-sectional area or morphology (Table 1). Profile 6d01734 saw a 22.9 m² (12%) increase in cross-sectional area with material accretion across the entire beach face. Profiles 6d01738 and 6d01742 saw a 5% increase in cross-sectional area, primarily across the upper beach face (Table 1).

Baseline - Spring

In comparison with the baseline survey of 2007, profiles 6d01734 – 6d01742 and 6d01754 indicated substantial accretion, ranging from 37-16 m² (Table 1). Only profile 6d01746 indicated erosion, losing 9 m² primarily from the upper beach face (Table 1).

Complete Data Comparison (2007-2021)

When comparing to the entire dataset (Fig.2), during the 2021 spring interim profiles 6d01734-6d01746 all indicated comparatively healthy cross-sectional areas, whereas profiles 6d01750 and 6d01754 indicated relatively low levels. When comparing profile cross-sectional areas to the entire time series (Fig.3), all profiles have remained relatively stable, with the exception of 6d01750 and 6d01746 which appear to undergo a regime shift after the spring of 2011.

Additional Comments

N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D3-10.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15/01/2020 – 12/01/2021</td>
<td>18/03/2007 - 12/01/2021</td>
<td></td>
</tr>
<tr>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d01734</td>
<td>22.9</td>
<td>12</td>
<td>36.8</td>
</tr>
<tr>
<td>6d01738</td>
<td>19.1</td>
<td>5</td>
<td>41.0</td>
</tr>
<tr>
<td>6d01742</td>
<td>13.0</td>
<td>5</td>
<td>16.1</td>
</tr>
<tr>
<td>6d01746</td>
<td>1.1</td>
<td>0</td>
<td>-8.7</td>
</tr>
<tr>
<td>6d01750</td>
<td>1.4</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>6d01754</td>
<td>3.6</td>
<td>1</td>
<td>19.8</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
South West Regional Coastal Monitoring Programme

Annual Survey Report 2021

C IS C A G : S o u t h  C o r n w a l l

Aerial Photography from 2018

Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

15 - 30 m²
5 - 15 m²
< 5 m²
> 30 m²

6d01734 (12%)
6d01738 (12%)
6d01742 (5%)
6d01746 (0%)
6d01750 (1%)
6d01754 (1%)

6d6D3-10: Carne Beach - Beach Change

C I S C A G : S o u t h  C o r n w a l l
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion
Erosion
No Change

6d01754 (7%)  
6d01738 (10%)  
6d01750 (1%)  
6d01742 (6%)  
6d01746 (-3%)  
6d01734 (20%)
Background

Portscatho consists of two east facing sandy beach profiles backed by the town of Portscatho to the south and a small dune system to the north; the beaches are separated by a rocky platform and confined by rocky headlands to the north and south. The beach has a cross-shore distance of ~120 m and longshore distance of ~750 m and a spring tidal range of 4.5 m.

Survey Unit Analysis

Analysis of the CPA suggests Portscatho is relatively variable but stable, having accreted by 0.2 m² y⁻¹ since the 2007 baseline (Fig.1). The beach was not surveyed after the initial 2007 baseline until the autumn of 2011. The lowest combined area was recorded during the initial baseline (390 m²) with the highest recorded during the 2015 spring interim (442 m²).

![Survey Unit 6d6D3-12 Combined Profile Area Chart](image)

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D3-12, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

**Spring – Spring**
Analysis of 2020 spring to 2021 spring data suggest profile 6d01821 has seen a gain of 11.4 m² (4%) in cross-sectional area (Table 1) primarily from in front of the sea wall and from the lower beach face. Profile 6d01835 has seen minimal change in cross-sectional area (Table 1), however has seen a drop in height in front of the sea defence by ~0.5 m.

**Baseline - Spring**
When comparing to the 2007 baseline survey, profile 6d01821 has accreted by 7.2 m² (4%) in cross-sectional area (Table 1), primarily from the lower beach face. Profile 6d01835 has seen a significant increase in comparison to the baseline, with a 29.9 m² (27%) gain in cross-sectional area primarily from the lower beach face, extending the MLWS mark seawards by ~20 m.

**Complete Data Comparison (2007-2021)**
When comparing to the entire dataset (Fig.2), during the 2021 spring interim both profiles were relatively healthy. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles remain relatively stable after the 2011 autumn interim.

**Additional Comments**
N/A

*Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D3-12.*

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master Profile Level (m)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15/01/2020 – 12/01/2021</td>
<td>15/03/2007 - 12/01/2021</td>
</tr>
<tr>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6d01821</td>
<td>11.4</td>
<td>4</td>
</tr>
<tr>
<td>6d01835</td>
<td>1.1</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
6d6D3-12: Portscatho - Beach Change

**Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)**

- Survey Unit Boundary

<table>
<thead>
<tr>
<th>Change in Cross-sectional Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 30 m²</td>
<td>1%</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>4%</td>
</tr>
<tr>
<td>&lt; 15 m²</td>
<td>14%</td>
</tr>
<tr>
<td>&gt; 30 m²</td>
<td>1%</td>
</tr>
</tbody>
</table>

Flymouth Coastal Observatory

Aerial Photography from 2018

CISCA: South Cornwall
Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
</tr>
</thead>
</table>

6d6D3-12: Portscatho - Beach Change

CISCAG: South Cornwall

Aerial Photography from 2018

Survey Unit Boundary

Accretion
No Change
Erosion

<table>
<thead>
<tr>
<th>$&gt; 30$ m$^2$</th>
<th>$15 - 30$ m$^2$</th>
<th>$&lt; 15$ m$^2$</th>
<th>$5 - 15$ m$^2$</th>
<th>$5 - 15$ m$^2$</th>
<th>$&gt; 30$ m$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6d01821 (3%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6d01835 (27%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Baseline 2007 to Spring 2021
Background

Swanpool consists of two separate sandy beaches both facing southeast and separated and confined by a rocky reef platform. Swanpool North (South) has a cross-shore distance of ~85 m (~60 m) and longshore distance of ~240 m (~140 m), both beaches have an average spring tidal range of 4.6 m.

Survey Unit Analysis

Analysis of CPA suggests Swanpool is relatively stable having accreted by 0.1 m² y⁻¹ since the 2007 baseline (Fig.1). The survey unit undertook a loss of 34.7 m² (equivalent to 4.5% of the combined average area) between the 2013 autumn interim and the 2014 spring interim, the latter also recording the lowest combined area at 728 m² (Fig.1). The highest combined area was recorded during the 2011 autumn interim (781 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-2, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
**Profile Analysis**

**Spring – Spring**
When comparing 2020 spring to 2021 spring data, both profiles have indicated minor erosion with 6d02097 and 6d02083 showing a 2% loss respectively (Table 1).

**Baseline - Spring**
When comparing to the 2007 baseline data, again both profiles indicated minor erosion (Table 1), with a movement of material from the lower beach face to the upper.

**Complete Data Comparison (2007-2021)**
When comparing to the entire dataset (Fig.2), during the 2021 spring interim both profiles were relatively unhealthy, with 6d2097 displaying its second lowest cross-sectional area to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles have remained relatively stable, with a noticeable decline over recent surveys.

**Additional Comments**
N/A

---

**Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-2.**

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13/01/2020 – 28/02/2021</td>
<td>21/03/2007 - 28/02/2021</td>
<td></td>
</tr>
<tr>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d02097</td>
<td>-7.1</td>
<td>-2</td>
<td>-2.4</td>
</tr>
<tr>
<td>6d02083</td>
<td>-5.8</td>
<td>-2</td>
<td>-5.8</td>
</tr>
</tbody>
</table>

---

N/A
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

<table>
<thead>
<tr>
<th>Category</th>
<th>Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 30 m²</td>
<td>22</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>22</td>
</tr>
<tr>
<td>&lt; 5 m²</td>
<td>2</td>
</tr>
<tr>
<td>5 - 15 m²</td>
<td>2</td>
</tr>
<tr>
<td>15 - 30 m²</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 30 m²</td>
<td>2</td>
</tr>
</tbody>
</table>

FLYMOUTH COASTAL OBSERVATORY
Aerial Photography from 2018

6d6D5-2: Swanpool - Beach Change

CISCAG: South Cornwall
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

6d6D5-2: Swanpool - Beach Change

CISCAG: South Cornwall
Background

Maenporth is an east facing, dissipative pocket beach backed by a through road and river floodplain and confined by two rocky headlands. The beach has a cross-shore distance of 290 m and longshore distance of 200 m with an average spring tidal range of 4.6 m.

Survey Unit Analysis

Maenporth has only one interim profile, which has shown to be seasonally variable and gradually accreting by 1.4 m² y⁻¹ since the 2007 baseline (Fig.1). The lowest area was recorded during the 2014 spring interim (448 m²) whereas the highest recorded area was during the 2017 baseline (487 m²).

Survey Unit

<table>
<thead>
<tr>
<th>Survey Unit</th>
<th>Local Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>6d6D5-4</td>
<td>Maenporth</td>
</tr>
</tbody>
</table>

*Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-4, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.*
Profile Analysis

Spring – Spring  
Analysis of 2020 spring to 2021 spring data suggests profile 6d02148 has seen no change in cross-sectional area (Table 1).

Baseline - Spring  
When comparing to the 2007 baseline, profile 6d02148 has seen a 7% increase in cross-sectional area equating to an accretion of 32 m² (Table 1), primarily across the low tide terrace, extending the MLWS mark seawards by ~10 m.

Complete Data Comparison (2007-2021)  
When comparing to the entire dataset (Fig.2), during the 2021 spring interim profile 6d02148 recorded the second highest cross-sectional area to date.

Additional Comments  
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-4.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring (13/01/2020 – 28/02/2021)</th>
<th>Baseline to Spring (23/03/2007 - 28/02/2021)</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6d02148</td>
<td>0.0</td>
<td>0</td>
<td>32.3</td>
</tr>
</tbody>
</table>

Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.
**Actual Change (m²) in Cross-sectional Area**
(Spring 2020 to Spring 2021)

- **Survey Unit Boundary**

**6d02148 (0%)**

### Cross-sectional Area

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²
- 5 - 15 m²
- > 30 m²

**Accretion**

**No Change**

**Erosion**
Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

- 6d02148 (7%)

Survey Unit Boundary

Aerial Photography from 2018

Accretion

No Change

Erosion
Background

Porthallow is a northeast facing gravel beach, backed by the village of Porthallow and confined to the north and south by rocky headlands with a rocky outcrop in the centre of the beach. The beach has a cross-shore length of ~90 m and longshore length of ~150 m with an average spring tidal range of 4.7 m.

Survey Unit Analysis

Analysis of the CPA suggests the beach has remained relatively stable, accreting at a rate of 1 m² y⁻¹ since the 2007 baseline (Fig.1). The beach was not monitored throughout the first phase, therefore there is gap in the data between the 2007 baseline and the 2012 spring interim. The largest loss of combined area was recorded during the 2013/14 winter, losing 13 m² between the 2013 baseline and 2014 spring interim, however the following survey (2014 autumn interim) saw a 25 m² gain. The highest combined profile area was recorded during the 2021 spring interim at (Fig.1). recording the highest combined area on record (908 m²).
Profile Analysis

Spring – Spring
When comparing spring 2020 data to the recent 2021 spring data, both profiles have shown minimal change in both cross-sectional area and morphology (Table 1).

Baseline - Spring
When comparing 2021 spring data to the baseline survey of 2007, both profiles have shown a minor increase in cross-sectional area by ~8 m² (2%) resulting in an extending of the MLWS mark seawards and flattening of the beach face (Table 1).

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), both profiles suggest very healthy cross-sectional areas, with 6d02326 recording the highest to date. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles have remained stable, with a minor loss in material recorded after the 2013/14 winter.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-10.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12/01/2020 – 03/03/2021</td>
<td>28/09/2007 - 03/03/2021</td>
<td></td>
</tr>
<tr>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d02326</td>
<td>3.5</td>
<td>1</td>
<td>7.7</td>
</tr>
<tr>
<td>6d02327</td>
<td>0.6</td>
<td>0</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change ($m^2$) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

- 6d02326 (1%)
- 6d02327 (0%)

Accretion
No Change
Erosion

> 30 m$^2$
15 - 30 m$^2$
5 - 15 m$^2$
< 5 m$^2$
Background

Porthoustock is an east facing reflective gravel beach, backed by a flat flood plain with a watercourse running to the southern extent, the beach is confined to the north by a rocky headland and to the south by a breakwater. The beach has a cross-shore distance of ~85 m and longshore distance of ~190 m with an average spring tidal range of 4.7 m.

Survey Unit Analysis

Porthoustock has only one profile, which has remained relatively stable, accreting at 0.5 m² y⁻¹ since the 2007 baseline (Fig.1), however there were no surveys conducted from the 2007 baseline to the 2012 spring interim. The lowest area was recorded during the 2012 autumn interim (1074 m²) with the highest area recorded during the 2018 autumn interim (1092 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-11, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Analysis of spring 2021 to spring 2020 data suggested a minimal change in profile 6d02372 with a gain of 3.3 m² in area primarily from the upper beach face (Table 1).

Baseline - Spring
In comparison to the 2007 baseline survey, again there has been minimal change with a gain of 2.3 m² in cross-sectional area (Table 1). Despite this, there has been a movement of material from the upper beach face to the MLWS mark. Beyond the beach crest there has been minimal change, as observed in previous years.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim profile 6d02372 had a healthy cross-sectional area.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-11.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12/01/2020 – 03/03/2021</td>
<td>27/09/2007 - 03/03/2021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6d02372</td>
<td>3.3</td>
<td>0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

No Change

Accretion

Erosion

6d02372 (0%)

0 50 100 m

Aerial Photography from 2018

FLYMOUTH COASTAL OBSERVATORY

CISCAG: South Cornwall
Actual Change ($m^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

6d02372 (0%)

Accretion

No Change

Erosion

Survey Unit Boundary

Aerial Photography from 2018

FLYING COASTAL OBSERVATORY

6d6D5-11: Porthoustock - Beach Change

CISCAG: South Cornwall
**Background**

Coverack is narrow, east facing, dissipative sandy beach backed to the southern extent by a series of sea defences and by a small, conglomerate cliff face to the north, the beach is confined to the south by a rocky outcrop with a series of sea defences and a car park atop and by a rocky platform to the north. The beach has a cross-shore distance of ~90 m and a longshore distance of ~200 m with an average spring tidal range of 4.7 m.

**Survey Unit Analysis**

Analysis of the CPA indicates a gradually accreting beach having gained 2.2 m$^2$ y$^{-1}$ since the 2007 baseline (Fig.1). The lowest combined area was recorded during the 2009 autumn interim (346.5 m$^2$) with the highest loss of 64.5 m$^2$ observed between the 2018 spring interim and the 2018 autumn interim (Fig.1). The highest combined area was recorded during the 2014 autumn interim (469 m$^2$) with the highest gain of 83 m$^2$ observed between the 2014 spring interim and the 2014 autumn interim.

![Survey Unit 6d6D5-12 Combined Profile Area Chart](image)

*Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-12, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.*
Profile Analysis

Spring – Spring
Analysis of spring-to-spring surveys has indicated erosion for both profiles with 6d02481 and 6d02485 losing 7.9 m² (4%) and 9.2 m² (5%) respectively (Table 1).

Baseline - Spring
In comparison to the 2007 baseline data, profile 6d02481 has seen a 2% loss in cross-sectional area, primarily along the low tide terrace. Profile 6d02485 has seen a 7% increase, equating to a 10.2 m² accretion across the entire beach face, extending the MLWS mark seawards by ~15 m.

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim both profiles indicated low cross-sectional areas. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles follow similarly high variance, highlighting the erosive events in the winter of 2018.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-12.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring Cross-Sectional Area</th>
<th>Baseline Cross-Sectional Area</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring to Spring</td>
<td>Baseline to Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12/01/2020 – 03/03/2021</td>
<td>20/03/2007 - 03/03/2021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td>6d02481</td>
<td>-7.9</td>
<td>-4</td>
<td>-3.8</td>
</tr>
<tr>
<td>6d02485</td>
<td>-9.2</td>
<td>-5</td>
<td>10.2</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

Aerial Photography from 2018
## Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

<table>
<thead>
<tr>
<th>Survey Unit Boundary</th>
<th>Actual Change (m²)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6d02481</td>
<td>-2%</td>
</tr>
<tr>
<td></td>
<td>6d02485</td>
<td>7%</td>
</tr>
</tbody>
</table>

**Aerial Photography from 2018**

**6d6D5-12: Coverack - Beach Change**

**CISCAG: South Cornwall**
Background

Kennack Sands East is a southeast facing sandy beach, backed by a small dune system and confined to the northeast by a rocky headland and to the southwest by a rocky reef platform separating the two Kennack beaches. The beach has a cross-shore distance of ~100 m and longshore distance of ~310 m with an average spring tidal range of 4.7 m.

Survey Unit Analysis

Kennack Sands East has only one profile which has remained relatively stable eroding at 0.7 m² y⁻¹ since the 2007 baseline and displaying a seasonal trend (Fig.1). The lowest recorded area was during the 2014 spring interim (232 m²) with the highest loss of 70 m² (equivalent to a 23% loss) between the 2013 baseline and the 2014 spring interim. The highest recorded area was during the 2012 autumn interim (351 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-14, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
Analysis of 2020 spring to 2021 spring data indicates a 61.5 m² (19%) loss in cross-sectional area (Table 1), with significant loss in material observed from the lower beach face, resulting in the steepening of the profile.

Baseline - Spring
In comparison to the 2007 baseline, there has been a 12.4 m² (4%) loss in cross-sectional area primarily due to the formation of a low tide terrace (Table 1).

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim, profile 6d02639 recorded a low cross-sectional area, the fourth lowest on record.

Additional Comments
N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-14.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Cross-Sectional Area</th>
<th>13/01/2020 – 02/03/2021</th>
<th>02/08/2007 - 02/03/2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>6d02639</td>
<td>-61.5</td>
<td>-19</td>
<td>-12.4</td>
</tr>
</tbody>
</table>

Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

Survey Unit Boundary

- > 30 m²
- 15 - 30 m²
- 5 - 15 m²
- 5 - 15 m²
- > 30 m²

Aerial Photography from 2018

FLYING COASTAL OBSERVATORY

6d6D5-14: Kennack Sands (East) - Beach Change

CISCAG: South Cornwall

Annual Survey Report 2021
Actual Change (m$^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion | No Change | Erosion

- > 30 m$^2$
- 15 - 30 m$^2$
- 5 - 15 m$^2$
- > 30 m$^2$
- < 5 m$^2$

6d6D5-14: Kennack Sands (East) - Beach Change

CISCAG: South Cornwall
Background

Kennack Sands West is a southeast facing, dissipative sandy beach backed by a small dune system to the northeast and a rocky shore platform backed by unconsolidated cliff to the southwest. The beach has a cross-shore distance of 140 m and longshore distance of 600 m with an average spring tidal range of 4.7 m.

Survey Unit Analysis

Analysis of CPA suggests the beach has been gradually eroding since the 2007 baseline at a rate of 5.5 m² y⁻¹ (Fig.1). The lowest recorded combined area was during the 2014 spring interim (761 m²) with the highest loss of 140 m² observed between the 2013 baseline and the 2014 spring interim. The highest recorded combined area was 2009 autumn interim (1,005 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-15, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring: Analysis of 2020 spring to 2021 spring data indicates profile 6d02646 saw a 58.5 m² (13%) loss in cross-sectional area primarily across the lower beach face with the MLWS mark shortening by over 50 m (Table 1). Profile 6d02651 saw minimal change whereas 6d02655 saw a 16.7 m² (6%) loss in cross-sectional area primarily from the lower beach face (Table 1).

Baseline - Spring: In comparison to the 2007 baseline, all profiles have displayed erosion ranging from 5-16% of the cross-sectional area (Table 1). Both profiles 6d02646 and 6d02651 have seen a moving of the MLWS mark landward by ~30 m.

Complete Data Comparison (2007-2021): When comparing to the entire dataset (Fig.2), all profiles appear to be relatively low in cross-sectional area. When comparing profile cross-sectional areas to the entire time series (Fig.3) all profiles have remained relatively stable with 6d02646 displaying the highest variability and impact following the 2013/14 winter.

Additional Comments: N/A

Table 1 - Cross-sectional area change in m² and percentage comparing spring to spring and baseline to spring analysis for all profiles in survey unit 6d6D5-15.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Spring to Spring</th>
<th>Baseline to Spring</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13/01/2020 – 02/03/2021</td>
<td>03/08/2007 - 02/03/2021</td>
<td></td>
</tr>
<tr>
<td>6d02646</td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
<td>CSA Diff (m²)</td>
</tr>
<tr>
<td></td>
<td>-58.5</td>
<td>-13</td>
<td>-37.9</td>
</tr>
<tr>
<td>6d02651</td>
<td>2.7</td>
<td>2</td>
<td>-30.4</td>
</tr>
<tr>
<td>6d02655</td>
<td>-16.7</td>
<td>-6</td>
<td>-13.4</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change (m²) in Cross-sectional Area (Spring 2020 to Spring 2021)

- Survey Unit Boundary

Accretion

No Change

Erosion

6d6D5-15: Kennack Sands (West) - Beach Change

CISCAG: South Cornwall
Actual Change (m$^2$) in Cross-sectional Area (Baseline 2007 to Spring 2021)

- 6d02646 (-9%)
- 6d02651 (-16%)
- 6d02655 (-5%)

Survey Unit Boundary

Accretion | No Change | Erosion
--- | --- | ---
> 30 m$^2$ | 15 - 30 m$^2$ | < 15 m$^2$

Aerial Photography from 2018
Background

Cadgwith consists of two small gravel beaches facing southeast which are separated by a rocky pillar, confined to the northeast and southwest by a rocky cliff and backed by the village of Cadgwith. The north (south) beach has a cross-shore distance of 80 m (65 m) and longshore distance of 66 m (60 m) with an average spring tidal range of 4.7 m.

Survey Unit Analysis

Analysis of the CPA suggests Cadgwith has seen been gradually accreting at 2 m² y⁻¹ since the 2007 baseline (Fig.1), however there were no surveys conducted until the 2011 autumn interim, with the 2007 baseline extracted from LiDAR. The lowest recorded combined area was during the 2012 autumn interim (586 m²) with the highest recorded during the 2020 spring interim (614 m²).

Figure 1 - The Combined Profile Area (CPA) for survey unit 6d6D5-17, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2021.
Profile Analysis

Spring – Spring
When comparing spring to spring surveys, both profiles have shown limited change in cross-sectional area (Table 1). Profile 6d02700A displayed a 4.9 m² (1%) loss in cross-sectional area (Table 1), with material moving from the upper beach face to the lower.

Baseline - Spring
In comparison to the baseline data obtained in 2007, profile 6d02700A has seen a 16.2 m² (5%) increase in cross-sectional area (Table 1), primarily across the upper beach face. Profile 6d02701A has seen minimal change (Table 1).

Complete Data Comparison (2007-2021)
When comparing to the entire dataset (Fig.2), during the 2021 spring interim both profiles displayed relatively high cross-sectional areas. When comparing profile cross-sectional areas to the entire time series (Fig.3), both profiles have stayed very stable throughout, gradually increasing their cross-sectional area.

Additional Comments
Baseline data has been acquired from LiDAR flown in September 2007.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Cross-Sectional Area Change</th>
<th>Master Profile Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring to Spring</td>
<td>Baseline to Spring</td>
</tr>
<tr>
<td></td>
<td>12/01/2020 – 02/03/2021</td>
<td>27/09/2007 - 02/03/2021</td>
</tr>
<tr>
<td></td>
<td>CSA Diff (m²)</td>
<td>% Change</td>
</tr>
<tr>
<td>6d02700A</td>
<td>-4.9</td>
<td>-1</td>
</tr>
<tr>
<td>6d02701A</td>
<td>2.1</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 2 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2021.

Figure 3 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2021.
Actual Change ($m^2$) in Cross-sectional Area
(Spring 2020 to Spring 2021)

Survey Unit Boundary

- $> 30 \text{ m}^2$
- $15 - 30 \text{ m}^2$
- $5 - 15 \text{ m}^2$
- $5 - 15 \text{ m}^2$
- $> 30 \text{ m}^2$

6d6D5-17: Cadgwith - Beach Change

CISCAG: South Cornwall
Actual Change (m²) in Cross-sectional Area (Baseline 2007 to Spring 2021)

Survey Unit Boundary

Accretion
No Change
Erosion

6d6D5-17: Cadgwith - Beach Change

CISCAG: South Cornwall