

**Cell 1 Regional Coastal Monitoring Programme
Hartlepool Headland 'Post Storm' Beach Monitoring
Survey Report 2023**



Hartlepool Borough Council

December 2023

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Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (**Figure 1**). Within this frontage, the coastal landforms vary considerably, comprising low-lying tidal flats with fringing salt marshes, hard rock cliffs that are mantled with glacial sediment to varying thicknesses, softer rock cliffs and extensive landslide complexes.

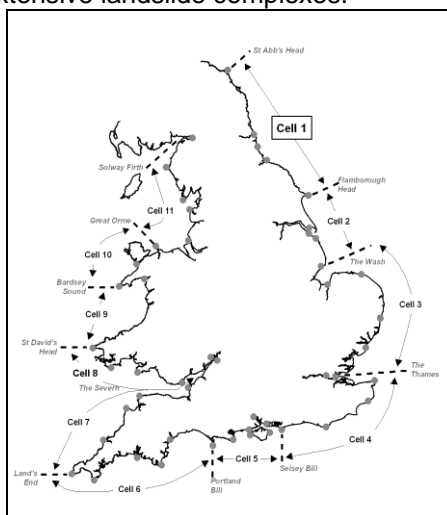


Figure 1 Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008¹ and is managed by Scarborough Borough Council on behalf of the North East Coastal Observatory. It is funded by the Environment Agency, working in partnership with the following organisations:



¹ Prior to 2008, coastal monitoring was undertaken on a consistent basis across Northumberland and North Tyneside as part of the (then) Northumbrian Coastal Authorities Group's monitoring programme which commenced in 2002, whilst several authorities between the River Tyne and Flamborough Head undertook their own local monitoring programmes.

Royal HaskoningDHV has been appointed to provide Analytical Services in relation to the present phase of the Cell 1 Regional Coastal Monitoring Programme, between 2016 - 2027. The main elements of the Cell 1 Regional Coastal Monitoring Programme involve:

- beach profile surveys
- topographic surveys
- cliff top recession surveys
- real-time wave data collection
- bathymetric and seabed characterisation surveys
- aerial photography
- LiDAR Surveys
- walk-over cliff and coastal defence asset surveys

The beach profile surveys, topographic surveys and cliff top recession surveys are undertaken as a 'Full Measures' survey in autumn/early winter every year. Some of these surveys are then repeated the following spring as part of a 'Partial Measures' survey.

Each year, an Analytical Report is produced for each individual authority, providing a detailed analysis and interpretation of the 'Full Measures' surveys. This is followed by a brief Update Report for each individual authority, providing ongoing findings from the 'Partial Measures' surveys.

During late October / early November 2023, the UK was subject to a period of stormy weather where three named storms occurred within a 4-week period (**Table 1**). To assess the impact of these storms on the coastline, a series of targeted **Post Storm Beach Profile / Topographic / Cliff Top Recession Surveys were** undertaken as part of the Cell 1 Regional Coastal Monitoring Programme. The report presents the analysis of the post-storm surveys undertaken at Hartlepool Headland.

Name	Date named	Date of impact on UK and/or Ireland and/or Netherlands
Agnes	25 September 2023	27 - 28 September 2023
Babet	16 October 2023	18 - 21 October 2023
Ciarán	29 October 2023	1 - 2 November 2023
Debi	12 November 2023	

Table 1 UK Named storms 2023 ([UK Storm Centre - Met Office](#))

Table 2 Analytical, Update and Overview Reports Produced to Date

Year		Full Measures		Partial Measures		Post Storm		Cell 1 Overview Report
		Survey	Analytical Report	Survey	Update Report	Survey	Post Storm Report	
1	2008/09	Sep-Dec 08	May 09	Mar-May 09		-	-	-
2	2009/10	Sep-Dec 09	Mar 10	Feb-Mar 10	July 10	-	-	-
3	2010/11	Aug-Nov 10	Feb 11	Feb-April 11	Aug 11	-	-	Sept 11
4	2011/12	Sep-Oct 11	Oct 12	Mar-May 12	Feb 13	-	-	-
5	2012/13	Sep 2012	Feb 13	April 13	May 13	-	-	-
6	2013/14	Sep-Oct 13	Feb 14	March 14	July 14	-	-	-
7	2014/15	Sep-Oct 14	Feb 15	April 15	Jun 15	-	-	-
8	2015/16	August 15	Feb 16	April 16	July 16	-	-	Jun 16
9	2016/17	Aug-Sep 16	Feb 17	Apr 17	Jul 17	-	-	-
10	2017/18	Sep-Nov 17	Feb 18	Mar 18	May 18	-	-	-
11	2018/19	Aug-Oct 18	Feb 19	Feb 19	May 19	-	-	-
12	2019/20	Sep-Oct 19	Nov 19	May 20	Jul 20	-	-	-
13	2020/21	Sep-Oct 20	Feb 21	Apr 21	May 21	-	-	Aug 21
14	2021/22	Sep 21	Nov 21	Apr 22	Jun 22	-	-	-
15	2022/23	Sep-Oct 22	Jan 23	Apr 23	Jun 23	-	-	-
16	2023/24	Sep-Oct 23	In Progress	-	-	Nov 23	Dec 23	-

(*) The present report provides an analysis of the 2023 Post Storm survey for the Hartlepool Headland frontage.

1. Introduction

1.1 Study Area

This report presents the Post Storm Walkover Inspection for Hartlepool Headland.

1.2 Methodology

Along Hartlepool Borough Council's frontage, the following post-storm surveys were undertaken;

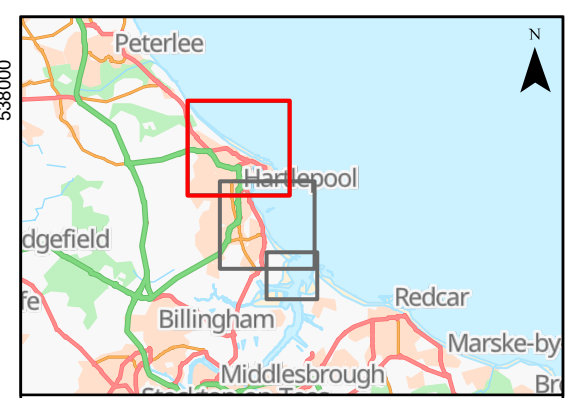
- Topographic survey along Hartlepool Headland

The location of these surveys is shown in **Figure 2**. The Post-Storm survey was undertaken along this frontage between 1st November 2023. During this time, the weather was dry and sunny. The wind was force 3 from the south. The sea state was slight.

The Analytical Report produced follows a standard structure, involving:

- description of the changes observed since the previous survey and an interpretation of the drivers of these changes (Section 2);
- documentation of any problems encountered during surveying or uncertainties inherent in the analysis (Section 3);
- recommendations for 'fine-tuning' the programme to enhance its outputs (Section 4); and
- providing key conclusions and highlighting any areas of concern (Section 5).

Data from the present survey are presented in a processed form in the Appendices.



SURVEY LOCATIONS

Topographic Profile

- Annual (Blue line)
- Bi-Annual (Pink line)

Topographic Area

- 6 monthly (Light Green)
- yearly (Yellow)
- 5 yearly (Purple)

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 World Imagery: Earthstar Geographics
 Hybrid Reference Layer: Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS
 GB Cartographic: Contains OS data © Crown Copyright and database right 2020
 Contains data from OS Zoomstack

Client:	Project:
North East Coastal Group	Cell 1 Regional Coastal Monitoring Programme

Title:

Figure 2 - Map 1

NORTH SANDS, HEADLAND, MIDDLETON

Hartlepool Borough Council Frontage

Report:

Survey Report

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:30,000

Co-ordinate system: British National Grid


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2. Analysis of Survey Data

2.1 Hartlepool Headland

Survey Date	Description of Changes Since Last Survey	Interpretation
<p style="text-align: center;">1st November 2023</p>	<p>Topographic Survey:</p> <p>Hartlepool Headland is covered by a five yearly topographic survey that began in 2008. Data from the 2023 Post Storm survey has been used to create a DGM (Appendix A – Map 1) using a GIS package. This DGM has been compared against the DGM from the November 2023 topographic surveys to identify areas of net erosion and accretion as a result of the storms (Appendix B – Map 5).</p> <p>The figure shows that at Throston Scar there has been an approximate 450m length of significant erosion (up to 1.75m in level) at the toe of the seawall. The Post Storm walkover inspection confirmed that along the majority of this length the bedrock has been exposed as a result of this beach change, as shown in Figure 3. This material appears to have been draw down onto the lower beach, as the figure shows the lower extents have been dominated by accretion (of up to 1.25m). Around the headland itself the foreshore has been dominated by low level, patchy erosion. This pattern of change is typical of sediment moving across the rocky foreshore here.</p> <p>South of Heugh breakwater, the bay has been dominated by erosion, particularly in the lee of the breakwater itself. Towards the centre of the bay, erosion dominated the lower beach (up to -0.75m) whilst the vegetated upper beach has remained more stable.</p>	<p>The topographic survey difference plot shows that the most significant change has occurred at Throston Scar where up to 1.75m depth of sediment has been draw down and moved away from the toe of the seawall over an approximate 450m length. This length of erosion also corresponds with the damage to the precast concrete seawall observed both in the walkover inspection and by the topographic surveyors.</p> <p>It is thought this frontage was particularly vulnerable due to being perpendicular to the direction of the largest Storm (Babet) which hit the coast from a North Eastly direction.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	 <p data-bbox="338 1198 1272 1230">Figure 3 Exposed rocky foreshore at Throston Scar November 2023</p>	

3. Problems Encountered and Uncertainty in Analysis

No major problems were encountered during the survey (as per the survey report).

4. Recommendations for 'Fine-tuning' the Monitoring Programme

No further 'fine-tuning' is recommended at the present time.

5. Conclusions and Areas of Concern

The topographic survey difference plot shows that the most significant change has occurred at Throston Scar where up to 1.75m depth of sediment has been draw down and moved away from the toe of the seawall over an approximate 450m length. This length of erosion also corresponds with the damage to the precast concrete seawall observed both in the walkover inspection and by the topographic surveyors.

It is thought this frontage was particularly vulnerable due to being perpendicular to the direction of the largest Storm (Babet) which hit the coast from a North Eastly direction.

Appendices

Appendix A
Topographic Survey



TOPOGRAPHIC SURVEY (1st November 2023)

Elevation (mOD)	Contours (mOD)*
-1.5 - -1.5	— 1.0m interval
-1.4 - -1	— 0.25m interval
-0.9 - -0.5	
-0.4 - 0	
0.1 - 0.5	
0.6 - 1	
1.1 - 1.5	
1.6 - 2	
2.1 - 2.5	
2.6 - 3	
3.1 - 3.5	
3.6 - 4	
4.1 - 4.5	
4.6 - 5	
5.1 - 5.5	

* Contours only cover sandy beach areas.

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Client:	Project:
North East Coastal Group	Cell 1 Regional Coastal Monitoring Programme

Title:

Appendix A - Map 1

Hartlepool Headland

Hartlepool Borough Council Frontage

Report:

'Post Storm' Survey 2023

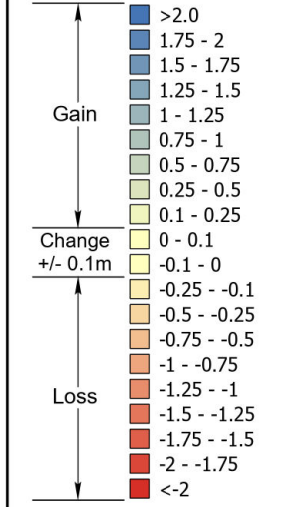
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	12/12/2023	TC	TW	A3	1:6,000

Co-ordinate system: British National Grid





Difference between topographic surveys
(October 2023 to November 2023)
Change in Elevation (mOD)



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Title:
Appendix A - Map 2
Hartlepool Headland
Hartlepool Borough Council Frontage

Report:
'Post Storm' Survey 2023

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	12/12/2023	TC	TW	A3	1:6,000

Co-ordinate system: British National Grid



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