

Note / Memo

**HaskoningDHV UK Ltd.
Water**

To: Robin Siddle
From: Ewan Richardson & Nick Cooper
Date: 26 November 2018

Subject: Cell 1 Coastal Asset Condition Summary_v2

1 Introduction

The following note sets out summary statistics of the Cell 1 coastal defence data held in the SANDS database that has been established under the Cell 1 Regional Coastal Monitoring programme.

Cell 1 covers the coastline between St. Abb's Head in Scotland and Flamborough Head in East Yorkshire, covering the councils of Scottish Borders (part), Northumberland, North Tyneside, South Tyneside, Sunderland, County Durham, Hartlepool, Redcar & Cleveland, Scarborough and East Riding of Yorkshire (part).

The Cell 1 Regional Coastal Monitoring programme covers the majority of this frontage, but the short section between St. Abb's Head and the Scottish Border is covered separately by Scottish Borders Council as part of management of its wider overall frontage, and the section between Speeton and Flamborough Head is likewise covered separately by East Riding of Yorkshire Council in management of its wider overall frontage.

2 Source of data and status

The asset length, location and categorisation data summarised in this note is based on analysis of the Cell 1 coastal defence data held on a SANDS Cell 1 Regional Coastal Monitoring database.

An Excel format download of relevant sections from the database was generated in November 2018. This database holds the findings from all walkover coastal inspections undertaken to date as part of the Cell 1 Regional Coastal Monitoring programme for both defended and undefended lengths of shoreline, except for the sea cliffs of the Cleveland and North Yorkshire coasts between Saltburn and Speeton. These cliffs are considered in a different manner to the sea cliffs elsewhere within Cell 1 due to their geology and geomorphological behaviour (essentially predominantly landslip-prone cliffs), with these data being held on a separate GIS database.

The inspection data for each of the asset lengths is from the summer/autumn 2018 walk over surveys.

Note that the SANDS database also holds historical inspection data and photographs for most assets, with inspections typically having been undertaken at 2 year intervals since 2002 (Scottish Border to River Tyne) or 2008 (River Tyne to Speeton). In addition to the regular inspections, SANDS also holds data for other ad-hoc inspections such as post storm inspections for a few assets and in some cases baseline data from MAFF's Coast Protection Survey of England surveys undertaken in the 1990s.

3 Overall Summary Data

Overall lengths of frontages recorded in the database are provided in Table 1. Note that the lengths reported will not be the same as the overall coastline length for each authority as some assets such as harbour breakwaters are dual sided and in some locations inner and outer faces are recorded as separate assets but in other locations both sides are the same asset.

Local Authority	Defended frontage length (km)	Natural shoreline length (km)	Total length (km)	Number of assets
Northumberland County Council	32.30	117.30	149.60	346
North Tyneside BC	9.80	3.00	12.80	67
South Tyneside MBC	5.40	8.00	13.50	28
Sunderland City Council	11.90	6.40	18.30	38
Durham County Council	11.60	8.30	20.30	33
Hartlepool Council	15.60	5.00	20.60	49
Redcar and Cleveland BC	8.10	21.00	29.10	33
Scarborough Borough Council	19.10	80.30	99.50	176
Grand Total	113.80	249.30	363.70	770

Table 1 - Cell 1 asset frontage lengths by local authority area [2018]

4 Summary asset condition data by local authority area

For built assets the condition grading classification held in the database is from walk over inspections undertaken in accordance with the Condition Assessment Manual (EA, 2011). An extract of the grading classification for built assets is presented in Table 2.

Grade	Rating	Description
0	Redundant	Redundant defence no longer required or replaced by alternative asset ref
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce performance of the asset.
4	Poor	Defects that would significantly reduce performance of the asset. Further investigation needed.
5	Very Poor	Severe defects resulting in complete performance failure.

Table 2 - Condition assessment grading for man-made assets

For natural assets, such as sand dunes, sea cliffs and coastal slopes, the grading and rating system shown in Table 2 has been used in the inspections for most areas (with the description modified to reflect the fact that natural, rather than built assets are being considered), but for the predominantly landslip-prone cliffs in Cleveland and North Yorkshire the five-point activity scale shown in Table 3 has in preference been used.

Rank	Activity Class	Description
1	Dormant	Protected cliff line or landslide complex with no visible evidence of landslide activity.
2	Inactive	Relict cliffs or landslides with vegetated slopes and localised erosion of the toe or failure of the headscarp.
3	Locally	Retreating cliff line with localised small landslides or areas of erosion.
4	Partly	Retreating cliff line with very common smaller-scale landslides or areas of intense erosion.
5	Totally	Retreating cliff line almost entirely affected by large-scale landsliding or intense erosion.

Table 3 - Activity scale grading for natural coastal assets in Cleveland and North Yorkshire

The following tables provide a breakdown of the length and condition of coastal assets in each local authority area for both defended and undefended frontages based on the 2018 walkover inspections. The 2016 results are also retained in the tables for purposes of comparison.

Note that assets with a condition category given as blank are either redundant OR have not been inspected within the Cell 1 programme, for example this includes some port breakwaters and quay walls where there was no public access

Northumberland

Northumberland County Council										
Condition	Defended		Undefended		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.8	3	0.3	2	0.3	3	0.5	5	1.1	5
2	10.2	63	74.8	82	79.8	135	80.8	136	85.2	145
3	14.5	83	33.2	56	51.8	152	50.3	148	47.7	139
4	5.8	29	7.4	21	15.0	52	15.8	52	13.2	50
5	1	4	0.3	1	2.0	6	1.5	6	1.3	5
(blank)					1.3	2	1.3	2	1.3	2
Grand Total	32.33	182	117.3	164	150.2	350	150.2	349	149.6	346

Table 4 - Summary asset data for Northumberland County Council

Note: In the years between 2014, 2016 and 2018 some asset were changed (e.g. split or merged) and/or included or omitted from the inspections.

Generally, there has been an ongoing overall improvement in the condition of coastal defence assets within the Northumberland County Council frontage. This is evidenced by the increase in the number of assets in 'very good' or 'good' condition between the 2014, 2016 and now 2018 walkover inspections.

The majority of the improvements in the condition of assets can be attributed to the implementation of capital schemes across the region. Prior to the 2016 inspections schemes in Boulmer and on Holy Island improved the condition of several assets. These repairs have been found to be effective and in 2018 they have retained their upgraded status'. Between 2016 and 2018 further capital and maintenance schemes in; Seahouses, Beadnell, Amble, and at the mouth of the River Aln, have improved the condition of assets in these areas.

Although it may on face value appear that the maintenance budgets are currently sufficient to sustain, although not necessarily improve, condition of assets in Northumberland, this conclusion is slightly misleading. Over 55% of the assets remain in 'fair' or worse condition, and several assets classified as being in 'very poor' condition in 2016 have not been repaired, and in some cases deteriorated further. Notable examples include the low masonry wall at the foot of Church Hill, Alnmouth, and the Seahouses Main Pier, where capital works are urgently required to ensure the ongoing functionality of the harbour.

Despite some significant loss of material in the March 2018 storms beach levels generally appeared to be in a healthier state than in 2016. Additionally, a number of undefended coastal slopes which showed signs of ongoing erosion in 2016 were found to be more stable in 2018, notably the low cliffs around Newton Point.

It is expected that significant maintenance and repairs will need to be undertaken across the frontage as structures deteriorate or suffer further storm damage, with capital schemes also needed at appropriate intervals.

North Tyneside

North Tyneside Council										
Condition	Defended		Undefended		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.5	3	0.0	0	0.2	1	0.2	1	0.5	3
2	6.0	28	1.2	5	5.7	31	6.1	31	7.2	33
3	2.5	19	1.8	9	6.4	33	5.6	32	4.3	28
4	0.4	2	0.0	0	0.1	1	0.4	2	0.4	2
5	0.5	1	0.0	0	0.5	1	0.5	1	0.5	1
(blank)										
Grand Total	9.8	53	3.0	14	12.8	67	12.8	67	12.9	67

Table 5 - Summary asset data for North Tyneside Council

The condition of assets within the North Tyneside Council frontage has improved considerably over recent years. This is in a large part thanks to the capital works undertaken as part of the Whitley Bay Seafront Master Plan. Since 2016 significant capital and maintenance works have been undertaken on the North and Central Promenades, particularly around the Spanish City complex. Prior to 2016 several assets such as the Cullercoats South Pier have benefited from refurbishment works and are now in 'very good' or 'good' condition.

Although the undefended dunes along Longsands beach still show some signs of the toe erosion which occurred in March 2018, there is a general trend of recovery, with some sediment deposition and embryo vegetation growth evident.

There are however some areas of ongoing concern, these include the St. Mary's Island causeway, the southern tie-in of the Tynemouth Pool wall and the most northerly of the 'bullnose' features along the Whitley Bay Promenade. Additionally, the 2018 inspection reports highlight an ongoing concern with the condition of a rock stack near Tynemouth North Point which has the potential to topple imminently and as such is a significant public safety hazard.

It can be concluded that maintenance budgets in North Tyneside are being utilised effectively and pro-actively by prioritising the revenue spend on areas flagged up by the 2-yearly walkover inspections undertaken as part of the Cell 1 Regional Coastal Monitoring programme. As such, pro-active maintenance and re-active repairs are currently generally sustaining, and in some cases improving, condition of the assets in North Tyneside according to a face value analysis of the statistics.

The ongoing capital works which form part of the Whitley Bay Seafront Masterplan are assisting and will continue to assist in improving the condition of some assets in the near future where current ongoing maintenance is barely keeping pace with the abrasion and damage that is being caused (e.g. St. Mary's Island causeway), but other areas will continue to rely on both pro-active, prioritised maintenance, and re-active post-storm repairs as necessary to sustain their condition.

South Tyneside

South Tyneside Council										
Condition	Defended		undefended		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.9	4	0.0	0	1.1	6	1.1	5	0.9	4
2	0.7	5	0.6	2	4.2	6	1.2	6	1.3	7
3	3.8	5	3.1	7	3.5	11	6.9	12	6.9	12
4	0.0	0	3.4	3	3.9	3	3.4	3	3.4	3
5	<0.1	1	0.9	1	0.8	1	0.9	2	0.9	2
(blank)	0.0	0	0.0	0	0.0	0	0	0		
Grand Total	5.4	15	8.0	13	13.5	27	13.5	28	13.5	28

Table 6 - Summary asset data for South Tyneside Council

Generally, there are no major concerns along the South Tyneside Council frontage, with the exception of the Redwell Steps/ Lifeguard Station in Marsden Bay and the ongoing expansion of the sinkholes and caves in Whitburn Coastal Park.

In recent years a number of assets have benefited from substantial capital investments. These include the Littlehaven sea wall and promenade scheme which was completed in 2014 and the rock revetment at Trow Quarry which continues to effectively prevent the wash-out of waste material. Additionally, the dunes at Sandhaven appear to be replenishing with a substantial volume of sand now having accreted across this section of the frontage.

There are some defects that have not been rectified for such a long time that the situation is now beyond the remit of maintenance or repair and requires more significant investment. These include the aforementioned caves and sink hole at Whitburn Coastal Park and the access steps and former Lifeguard Station at Redwell Steps in Marsden Bay, where there are interlinked issues of very poor structural condition and instability of the adjacent cliffs. It is highly recommended that further monitoring and capital works are undertaken to guarantee public safety in this area.

Sunderland

Sunderland City Council										
Condition	Defended		undefended		Totals 2014		Totals 2016		Totals 2016	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.0	0	0.0	0	0.0	0	0.0	0	0	0
2	2.4	4	0.6	1	4.6	6	4.6	6	3.0	5
3	4.3	12	0.0	0	5.6	17	6.5	18	4.3	12
4	4.2	11	3.9	3	7.1	11	6.4	11	8.1	14
5	1.0	4	0.0	0	0.9	4	0.8	3	1.0	4
(blank)	0.0	0	1.9	3	0.0	0	0.0	0	1.9	3
Grand Total	11.9	31	6.4	7	18.3	38	18.3	38	18.3	38

Table 7 - Summary asset data for Sunderland City Council

Prior to 2016 there were a number of notable investments made to repair many of the assets which were badly damaged by storms in 2013-14. Since 2016 the condition of coastal defence assets across the Sunderland City Council frontage has continued to deteriorate.

During the 2018 walkover inspections many major defects requiring urgent attention were observed. These include the New South Pier, the collapsed wall fronting the Northumbrian Water Ltd Sewerage Treatment Works and most concerningly the Stonehill Wall seawall and deckslab south of the New South Pier which was significantly damaged by storms in March 2018.

North of the River Wear, improvements have been made to the Roker Pier by replaying handrailing and construction of a new deck. These appear to be effective. Although the Old North Pier is not considered as a coastal defence it has been included within the scope of asset inspections since 2010. In March 2018 it was breached, since which it has had a number of substantial reactive maintenance activities carried out upon it which appear to be effective.

In considering future maintenance requirements, it should be noted that there remain many defects that require attention, particularly at Old North Pier and on many of the assets within the Port of Sunderland.

County Durham

County Durham Council										
Condition	Defended		Undefended		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.0	0	0.0	0	0.6	1	0.6	1	0.0	0
2	0.9	3	1.2	2	1.7	7	1.5	4	2.1	5
3	10.0	19	7.2	4	16.1	16	17.2	23	17.2	23
4	0.2	1	0.4	1	0.5	2	0.5	2	0.5	2
5	0.0	0	0.0	0	0.0	0	0	0	0	0
(blank)	0.5	3	0	0	1.4	7	0.5	3	0.5	3
Grand Total	11.6	27	8.3	6	20.2	33	20.3	33	20.3	33

Table 8 - Summary asset data for County Durham Council

The condition of coastal defence assets within the County Durham Council remain very much unchanged since the 2016 walkover inspections. Generally, most assets remain in 'good' or 'fair' condition. The area has benefited from significant recent investment such as the North Dock Regeneration Project at Seaham Harbour.

There are several areas where defects have been reported but untreated for some considerable time, for example Seaham seawall where the access ramp at the southern extent of the wall remains in poor condition and is a significant potential hazard to pedestrians.

In addition to the above, several sections of undefended frontage have re-activated due to loss of beach material leading to increased erosion rates at the toe of cliff units. This is particularly noted at Ryhope Dene, Shippersea Bay and Crimdon Dene Caravan Park. Attention should be drawn to the proximity of public footpaths to the cliff edge in these areas.

At face value, the 'good' and 'fair' condition of the majority of most assets within this frontage indicate that maintenance budgets are being utilised reasonably effectively, in reality there are several areas which require further maintenance and/or capital investment. There is a significant risk that without intervention the condition of some historic assets such as the Seaham Harbour South Pier and Dawdon Dene Outfall may deteriorate further rapidly.

Hartlepool

Hartlepool Borough Council										
Condition	Defended		undefended		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.7	2	0.0	0	1.2	4	1.2	4	0.7	2
2	4.3	6	3.0	3	8.0	12	8.1	12	7.3	9
3	4.0	16	2.1	1	8.7	26	8.8	27	6.1	17
4	2.1	3	<0.1	1	2.5	5	2.4	4	2.1	4
5	0.2	2	0.0	0	0.1	1	0.1	1	0.2	2
(blank)	4.2	15	0.0	0	0.1	1	<0.1	1	4.2	15
Grand Total	15.6	44	5.1	5	20.6	49	20.6	49	20.6	49

Table 9 - Summary asset data for Hartlepool Borough Council

The condition of assets within the Hartlepool Council is skewed somewhat by the high number of ungraded assets following the 2018 inspections. There are several reasons why such a large number of assets (15) were not inspected during 2018.

Principally, 9 assets within the Port of Hartlepool (Victoria Harbour) were not inspected as they are not considered coastal defence assets. In addition to this, ongoing works around the Hartlepool Headland prevented inspection of recently constructed coastal defence assets.

Despite the 2016 report indicating that an improvement in general conditions was expected in 2018, this does not appear to be the case. In part, this is due to the lack of data for many assets, however it is also due to the continuing deterioration in many assets. Specifically, the North Gare breakwater which remains in poor condition despite recent concrete repair work. There has been significant worsening of washout and settlement of the concrete block revetment to the south of the Hartlepool Marina gate.

It should be noted that the recently constructed walls along the Seaton Carew frontage remain in 'very good' condition and repairs to the Town Wall appear to be effective.

The ongoing deterioration of several assets, such as the Spion Kop and North Gare breakwater indicate that there is a possible shortfall in maintenance resource. The condition of assets in 'poor' and 'very poor' condition should be monitored rigorously to guarantee public safety and maintain their functionality as coastal defences. By 2020 capital works around the Headland will be complete which will improve the overall outlook of assets in this frontage.

Redcar & Cleveland

Redcar and Cleveland Borough Council										
Condition	Defended		Undefended		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	2.7	6	0.0	0	2.7	6	2.7	6	2.7	6
2	1.1	4	0.1	1	6.0	6	6.5	7	1.1	5
3	2.4	11	10.7	4	4.2	12	4.3	13	13.1	15
4	1.9	3	3.2	2	4.2	5	4.9	4	5.0	5
5	0	0	0.0	0	0.0	0	0	0	0.0	0
(blank)			7.1	2	12.0	4	10.7	3		
Grand Total	8.1	24	21.0	8	29.1	33	29.1	33	29.1	33

Table 10 - Summary asset data for Redcar & Cleveland Borough Council

The Redcar & Cleveland Borough Council frontage has benefited from recent capital investment schemes along the Redcar town frontage and in the village of Skinningrove. Generally, assets benefitting from these schemes have retained improved condition ratings in 2018.

However, there are a number of growing concerns at the northern and southern extents of the frontage, these are; the South Gare breakwater structure which although appears to be performing effectively is noted as having numerous significant defects, and Cowbar Nab which shows ongoing signs of erosion and continues to be closed to the public.

Although maintenance budgets appear to be being utilised effectively, there are some assets with long-standing issues (e.g. Cowbar), or assets which remain in 'poor' condition which would invariably benefit from increased maintenance spend.

One long-standing erosion issue is at Cowbar, where ongoing erosion to the cliff units north of Cowbar Lane threatens the integrity of the road and access onto the headland. In this location laserscanning of the cliffs is undertaken to improve understanding of rates and locations of change.

Scarborough

Scarborough Borough Council										
Condition	Defended 2018		Undefended 2018		Totals 2014		Totals 2016		Totals 2018	
	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets	Length (km)	No of assets
1	0.8	2	0.0	0	0.0	0	0.8	1	0.8	2
2	3.5	25	0.0	0	3.5	21	3.5	22	3.6	25
3	12.4	94	0.3	1	12.4	101	12.8	99	12.7	94
4	1.6	12	1.5	4	5.3	22	3.9	17	3.1	16
5	<1	2	0.3	2	0.5	4	0.5	6	<0.5	2
(blank)*	0.7	5	78.2	29	78.4	30	78.6	33	78.9	34
Grand Total	19.1	140	80.3	36	100.1	178	100.1	178	99.5	176

Table 11 - Summary asset data for Scarborough Borough Council

Note: In the years between 2014, 2016 and 2018 some asset were changed (e.g. split or merged) and/or included or omitted from the inspections.

The Scarborough Borough Council frontage is comprised of a large number of structural defence assets and natural (undefended) cliff units. In recent years there have been a number of capital schemes including the Sandsend Road scheme which improved the asset condition to 'very good' in this location, and the Scarborough RNLI lifeboat station (completed 2016).

There are a large number of built coastal defence assets along this stretch of coastline, generally associated with the coastal towns and villages. Many of these assets are in good or fair condition but there are a large number that require minor repair works, a few where more significant works are recommended and several locations where urgent attention to provide further more detailed assessments are recommended. The most common works required include blockwork repointing, resealing of joints, reinforcement of undercut sections, repairing cracks and resurfacing.

During 2018 a number of capital schemes were underway or recently complete. These include the Flat Cliffs emergency works (completed Summer 2018) and the Scarborough Spa slope stabilisation which was underway at the time of inspection. Additionally, the Whitby Piers Rehabilitation works, although not underway at the time of inspection, were underway at the time of writing this overview. Further capital schemes in Robin Hood's Bay are expected to improve the condition of coastal defence assets in this area.

There is extensive ongoing maintenance work across the frontage, particularly in Scarborough North and South Bay, Cayton Bay and along the Filey Town sea wall.

It should be noted that at the transition between built and natural assets, there were frequent instances of outflanking. These were particularly significant in Robin Hood's Bay and Filey. Due to the recent high-profile instances of rock fall along the North Yorkshire coastline, it is highly recommended that issues of outflanking and instability in natural coastal assets is monitored extensively. This is particularly important in tourist hotspots such as Staithes, Robin Hood's Bay, Cayton Bay and Filey.

There is extensive evidence of previous repairs on many structures (some of which are in need of further repair), which suggests a relatively high, and ongoing, maintenance commitment. Many of these are reactive repairs to storm-damage, especially to coping walls, and a large proportion of the assets remain in only 'fair' or worse condition. Due to this it may be expected that maintenance and repair commitments will continue to be demanding simply in order to sustain the present condition of these structures, many of which are of Victorian age.

Note: Data on the condition of the undefended lengths of sea cliffs in Redcar & Cleveland Council and Scarborough Borough Council is not held in SANDS.

The cliffs in these two authority areas are subdivided into cliff behaviour units, the condition of which are rated in accordance with Table 3 and stored within a GIS, rather than SANDS. Further details of the condition of individual cliff units can be found within the walkover inspection reports for these frontages.

Figures 1 and 2, taken from the 2018 walkover inspection reports, summarise the condition of the cliffs.

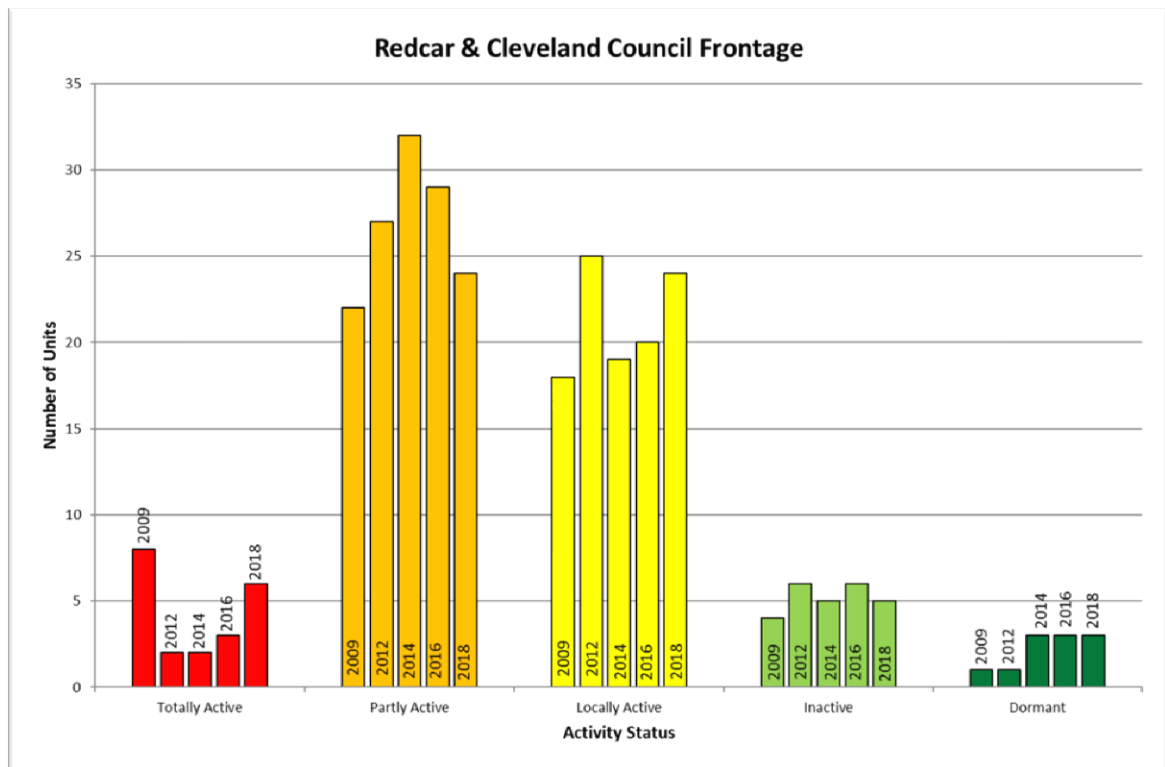


Figure 1 - Frequency of cliff activity along the Redcar & Cleveland frontage 2010 to 2018

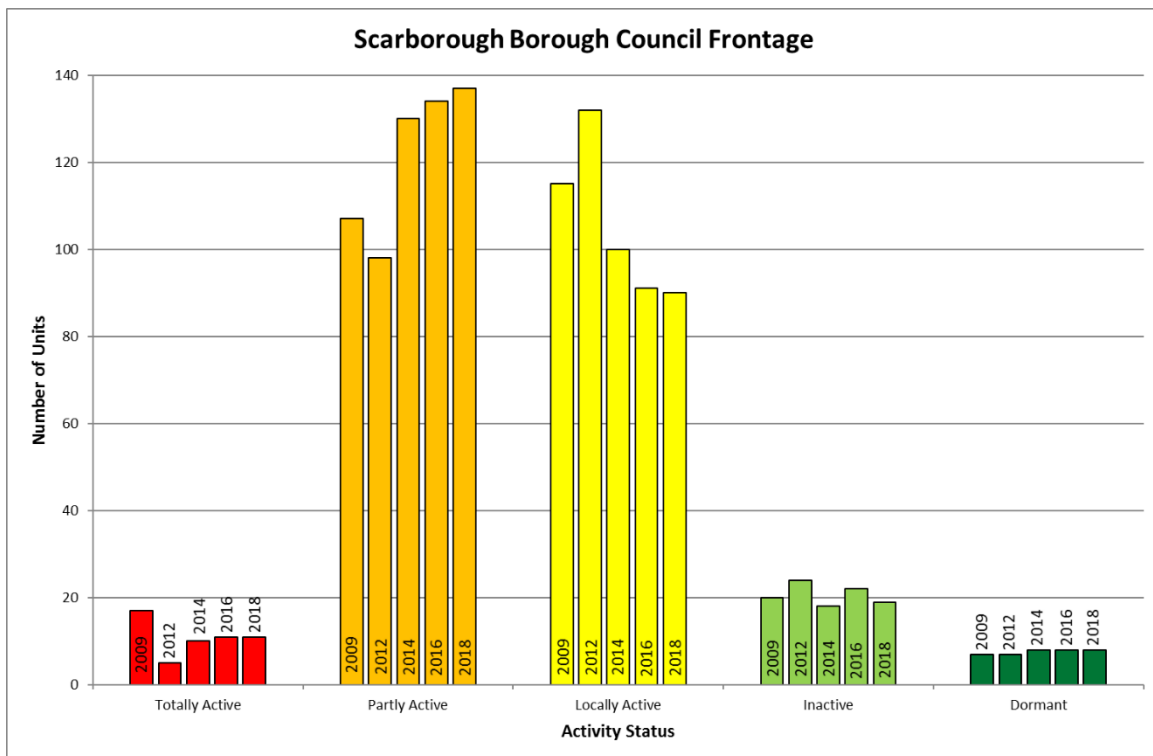


Figure 2 - Frequency of cliff activity along the Scarborough BC frontage 2009 – 2018

5 Summary

This note summarises statistics of the Cell 1 coastal defence data held in the SANDS database that has been established under the Cell 1 Regional Coastal Monitoring programme. The most up to date inspection data, collected over the summer of 2018 has been used in comparison with the previous two rounds of inspections (2016 & 2014).

Although not included within the SANDS database, Cliffs units (where applicable) have been characterised according to their present activity status and details.

6 Conclusion

This note can conclude that following the 2018 inspections the condition of assets across the Cell 1 frontage has remained generally stable with some localised areas of significant depreciation of condition. Several large-scale capital schemes completed in recent years were noted as being effective at improving the condition of built assets across the frontage and preventing coastal erosion. Regrettably, there are a number of assets highlighted as being in 'poor' and 'very poor' condition in 2016 which remain so in 2018.

In order to ensure public health and safety, and to ensure effective management of coastal defence assets throughout the frontage, ongoing monitoring and maintenance activities are essential.