



**Cell 1 Regional Coastal Monitoring Programme
Cambois Bay Post Storm Walkover Inspection
Surveys 2023**

**Northumberland County
Council**

December 2023

Northumberland County Council

Cambois Bay Post Storm Walkover Inspection Surveys 2023

Contents Amendment Record

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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.

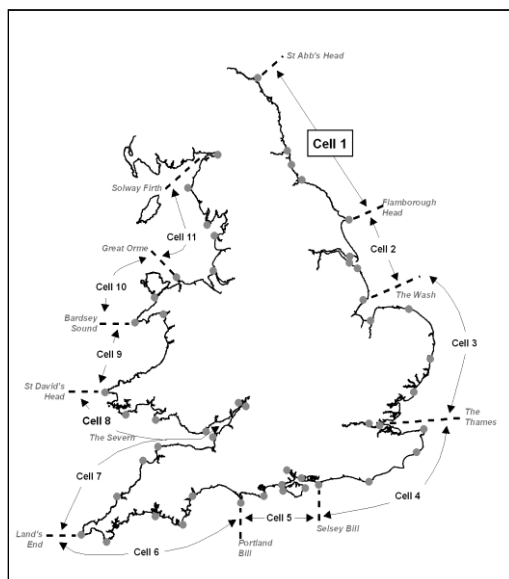


Figure 1 Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008¹ and is managed by North Yorkshire 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.

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 (Figure 2). To assess the impact of these storms on the coastline, a series of targeted **Post Storm Walkover Inspections** were undertaken as part of the Cell 1 Regional Coastal Monitoring Programme. The report presents the Post Storm Walkover Inspection surveys undertaken in Cambois Bay.

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	

Figure 2 UK Named storms 2023 ([UK Storm Centre - Met Office](#))

1. Introduction

1.1 Study Area

This report presents the Post Storm Walkover Inspection for Cambois Bay.

1.2 Methodology

The post storm walkover inspection for Lynemouth Bay was carried out on the 28th November 2023. The weather experienced during the inspections was generally clear and fine with no access or visibility problems caused by adverse weather.

The frontage has been split into a number of 'asset lengths' (**Appendix A**), as defined in the National Flood and Coastal Defence Database (NFCDD) that was established by the Environment Agency.

The walkover inspections cover both built defence assets and natural defence assets such as cliffs, slopes and dunes. All assets were visually inspected, photographed and graded based on their condition and an estimate made of their residual life.

For built assets the grading classification was undertaken in accordance with the Condition Assessment Manual (EA, 2012), with estimates made of the urgency of any necessary repairs. An extract of the grading classification for built assets is presented in **Table 1-1**. For ease of reference the built asset photographs presented in this report have also been bordered with the colours key indicated below.

Grade	Rating	Description
1	Very Good	'As built' condition or cosmetic defects that have no effect on performance.
2	Good	Minor defects that will not reduce overall performance of the asset.
3	Fair	Defects that could reduce overall performance of the asset.
4	Poor	Defects that would significantly reduce overall performance of the asset.
5	Very Poor	Severe defects resulting in overall performance failure of the asset.

Table 1-1: Condition assessment grading for man-made assets.

In addition to the above grading classification, for natural assets such as cliffs and slopes the same five-point activity scale used in previous walkover inspections within Cell 1 was used. This grading classification is presented in **Table 1-2**. For ease of reference the natural asset photographs presented in this report have also been bordered with the colours key indicated below.

Grade	Class	Description
1	Dormant	Features with no interaction with marine processes.
2	Inactive	Features with no visible evidence of erosion or landsliding activity.

3	Locally active	Features with localised evidence of small erosion or landsliding activity.
4	Partly active	Features with widespread evidence of small erosion or landsliding activity or areas of intense erosion or landsliding.
5	Totally active	Features with large-scale or intense erosion or landsliding.

Table 1-2: Condition assessment grading used for natural assets (cliffs/ slopes).

This report provides an overview of the findings from the walkover inspections, summarising each locality in general but also specifically identifying individual assets in 'poor' or 'very poor' condition. It is anticipated that this summary will help identify areas for maintenance or capital investment. Full details of the inspection of each asset are provided in **Appendix B**.

In addition to this report, full details of the inspection and a selection of appropriate photographs have been entered into the SANDS (Shoreline And Nearshore Database System) database and provided along with this report with SANDS viewer software. Additionally, all data from the obsolete Northumbrian Coastal Group MS Access database previously used for Northumberland coastal defence inspections from 2002 to 2010 has been imported to the SANDS database and a new asset data display form "Northumberland Sea Defence" has been created in SANDS to allow easy viewing of the data.

3. Condition Assessment

3.1 Cambois Bay (/3701C03 to /4001C05)

The cliffs fronting Sandy Bay Caravan Park are offered some protection by a sandstone boulder berm at their toe. To the north, additional protection is provided by a rocky outcrop on the foreshore, in this location the cliffs appear relatively stable with well vegetated seaward slope. Where the rocky outcrop tapers out, the cliffs appear more unstable and are actively eroding. The cliffs here have little to no vegetation on the seaward face and minor slumping is observed at the toe. As reported previously, in places, recession of the cliff top has occurred to within a few metres of the caravans. There are three near-shore rock breakwaters that have helped stabilise the cliffs immediately in their lee, but erosion then continues along the remaining cliff length immediately to the south to the mouth of the River Wansbeck. It appears the recent storms have only exacerbated erosion along this frontage.



Eroding cliffs fronting Sandy Bay Caravan Park (/3701C03)



One of three near shore breakwaters offering protection to backing cliffs (/3701C03)



Actively eroding cliff between breakwaters and River Wansbeck (/3701C03)



Actively eroding cliff between breakwaters and River Wansbeck (/3701C03)

As the coastline turns west at the mouth of the River Wansbeck, there is a sandstone cobble berm which has helped stabilise the dunes on the northern bank. Although the cobble berm is still present, it is clear beach levels have dropped in this area likely as a result of the recent storms. The lower dunes in this location have been overtopped during the recent storms with debris evident past the dune crest.

Within the estuary itself there are healthy dunes, sandflats and salt marsh and the channel of the River Wansbeck estuary diverts away from the north bank, more towards the south bank, around a large sand spit. No changes have been identified since last inspection with the exception of a large volume of storm material (mainly driftwood) that has been deposited.



Sand accumulating at the River Wansbeck mouth embankment in 2022 (/3801C01)



Lower beach levels at the same position post storms (/3801C01)

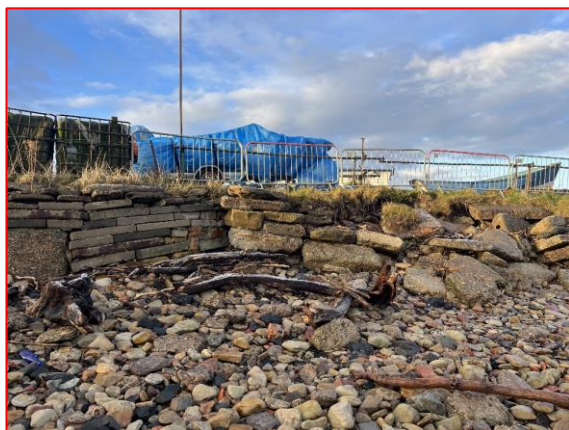


Overtopping evident during recent storms (/3801C01)

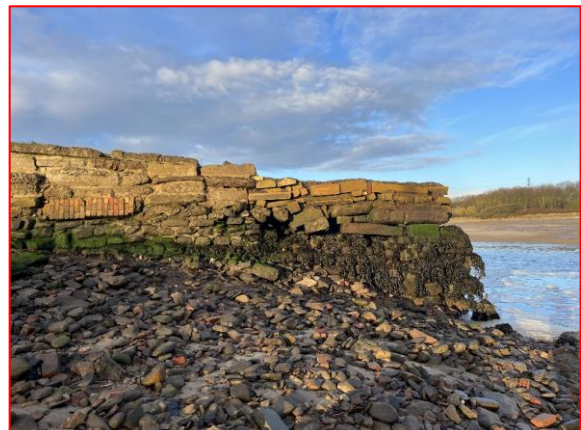


Storm debris at the River Wansbeck mouth (/3801C01)

On the south bank of the River Wansbeck, the private defences of the *Wansbeck Boat Club*, remain in very poor condition with partial collapses, significant voiding, and block loss evident. Despite this they still provide shelter to the boat club and thus are not redundant.



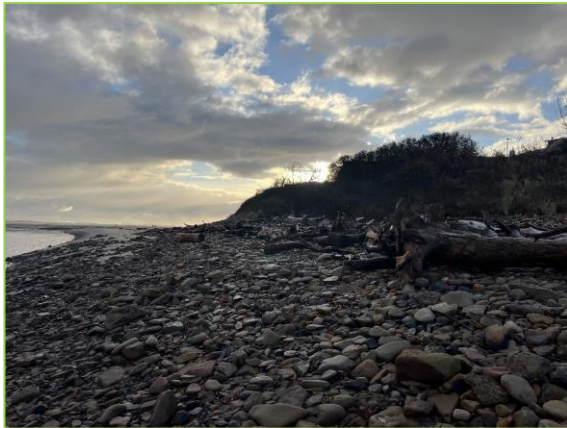
Wansbeck Boat Club retaining wall in very poor condition (/3801C02)



Wansbeck Boat Club retaining wall in very poor condition (/3801C02)

The undefended section of cliff (/3801C02) within the estuary mouth is very stable because, historically, the estuary channel is not directly at the toe of the cliff, leading to a good accumulation of sand, boulders and vegetation above the high tide mark. In the November 2023 inspection, the cliffs remain stable and

well vegetated, but the beach levels have dropped as a result of the recent storms and significant volumes of drift wood have been deposited at the toe of the cliffs.



Lower beach levels and storm deposits at the toe of the cliffs (/3801C02).



Lower beach levels and storm deposits at the toe of the cliffs (/3801C02).

Progressing from the sheltered estuarine frontage with its stable cliffs to the more active open coastline of Cambois Bay there is a transitional section of cliff fronting Cambois House (/3801C02). The cliffs were reported previously to be recovering due to sand accumulation at the toe but it appears the recent storms have reactivated them with erosion of the toe and slipping of vegetation down the face evident. Storm deposits are again visible at the toe of the cliffs.



Waterline cut back with moderate toe erosion (/3901C01)



Beach levels have dropped south of Cambois House (/3901C01)

The rock revetment to the south of the Cambois Links Car Park slipway remains overall in good condition. However, the recent storms have resulted in a notable drop in beach levels against the toe of the structure, particularly to the south, where the weathered foreshore has been exposed. Notable volumes of storm deposits were also visible on the on the earth slope backing the revetment.

The drop in beach level has revealed a number of the armour stones along the structure have been locally displaced, it is unclear whether this is recent damage or were just previously concealed. The two disused, corroded and failed outfall pipes remain crossing the beach at the southern end of the revetment, the drop in beach has revealed further defects notably a supporting steel pile is at risk of imminent failure. Emergency repair works should be undertaken to make this safe. The lower concrete slab of the ramp adjacent to the outfalls has been displaced since the previous inspection and should be repaired to reinstate safe access from the car park.

As noted previously, many of the concrete retaining panels embedded within the structure are breaking up and rust-stained from corroding rebar. It is thought this is not an issue since the revetment is well supported.



Rock revetment protecting former foundry site. Displaced lower rocks and storm debris visible (/3901C05)



Displaced lower ramp from car park adjacent to redundant outfalls. (/3901C05)

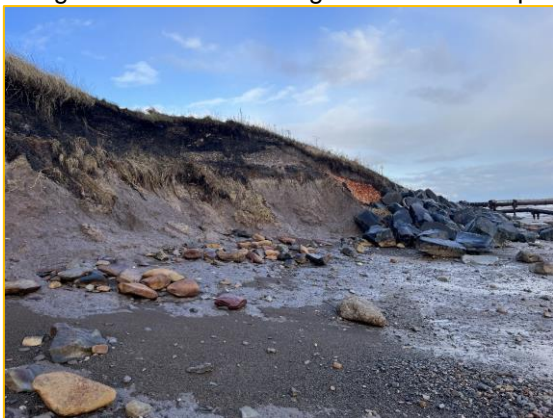


Low beach levels exposing further defects in abandoned outfalls (/3901C05)

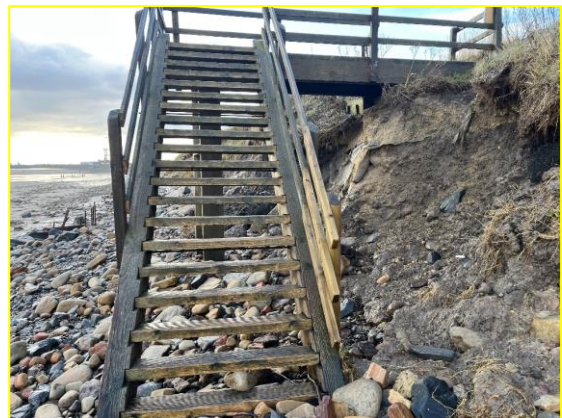


Low beach levels exposing weathered foreshore (/3901C05)

At the end of the revetment, the low earth cliffs to the immediate south (/3901C03) have experienced terminal erosion along a length of approximately 150m. It is clear the recent storms have only exacerbated the erosion with beach levels at a very low level and in places not present at all. The set of timber access steps are in fair condition, although require repairs to a lost section of handrail that make navigating the steep steps difficult. The cliffs behind the steps have continued to retreat exposing the hardcore foundation of the landing. This should be monitored closely. The soft cliffs merge almost imperceptibly into vegetated dunes which also appear to have been affected by the storms. Particularly to the south, the dunes are showing extensive loss of vegetation and collapse of the dune front face.



Outflanking at south end of the revetment (/3901C03)



Damaged handrailing to timber access steps (/3901C03)



Low beach levels exposing weathered foreshore (/3901C03)



Significant erosion to dune system (/3901C03)

The next section of low clay cliff/dunes (/3901C04), associated with the landfall works for export cables from the Blyth Offshore Demonstrator Windfarm (BODF), is built in lee of the Rockers outcrop. Following storm damage, repair to the dunes were undertaken which included sand-filled geotextile bags and marram grass turves plantation. A combination of erosion and low beach levels have exposed the sand bag repairs in the November 2023 inspection. It is clear some of the bags have also been lost as a result. The dunes to the south of the cable landing have also experienced recent erosion with slumping of the seaward face and vegetation slips evident. At one location the cobble berm at the toe of the cliff has accreted such that its now flush with the crest. It is clear in this location overtopping has occurred with storm debris evident past the crest.



Sandbags and reinstated dunes at cable landfall layout (/3901C04)



Exposed / damaged repair works (/3901C04)



Actively eroding dunes (/3901C04)



Accreted cobble berm flush with crest resulting in overtopping (/3901C04)

The North Blyth frontage is protected entirely by man-made defences. At the northern end, this comprises a substantial rock revetment with rock-filled gabions along the crest. The rock revetment itself appears to be unchanged since the previous survey and therefore, despite some displaced stones along the toe and areas of slight settlement of the profile, remains in good condition. As noted previously, the slope of the revetment seems to be more steep than recommended (1V:1.5H) which may have led to observed localised cliff stability failure and rotational failure of some gabions baskets. The gabions baskets adjacent to the failed section also have a rotated notably and are likely to failure in a similar manner in the future. The ramp from the beach to the car park is in fair condition however, localised rock slumping beneath has undermined the edge of the concrete slab, which will eventually fail.



Rock revetment buried northern tie in (/4001C01)



Localised cliff slide producing revetment movement and gabions failure on top of cliff (/4001C01)



Rotated gabions adjacent to failed section (/4001C01)



Ramp concrete slab undermining – needs to be repaired (/4001C01)

The remaining four assets defending the North of Blyth, down to the port's mouth are owned by the Port of Blyth. These assets are:

- A section of cliff protected by rock revetment (/4001C02), held by a steel breastwork, later completed with larger armour stone at the toe embedding the steel breastwork.
- A further section of cliff), fronting the Alcan aluminium and coke processing plants, protected by a composite structure (/4001C03) of timber breastwork on a mass concrete wall, with an upper slope of tipped rubble.
- A concrete seawall (/4001C04) extending to Blyth East Pier and including some concrete groynes over the bedrock plate to dissipate wave action.
- Blyth East Pier (/4001C05), an inclined concrete wall with a timber trestle on top.

The (/4001C02) steel breastwork is largely in a poor condition with extensive corrosion and numerous failed members. This issue is not relevant to the structural integrity of the revetment, since the upper armour rocks now rest on the newer and larger armour rocks of the toe. This interlocking process may

have produced some erosion and slumps observed in 2018 at the cliffs crest behind the revetment. These slumps do not seem to have progressed. In some areas construction waste and smaller rocks were tipped at the crest in a likely attempt to protect these sections. The structure appears largely unaffected by the recent storms, although beach levels have significantly dropped at the toe.



August 2022

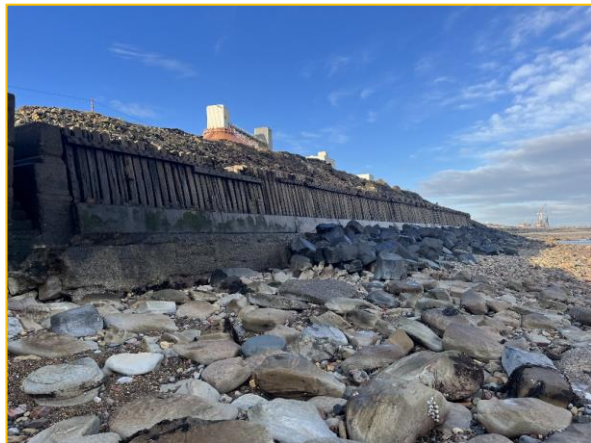
New rock armour placed at toe to create a stable slope, protecting the damaged steel (/4001C02)



November 2023

Low beach levels as a result of recent storms (/4001C02)

The timber breastwork of the composite structure (/4001C03), sits on a concrete apron with rock armour at the toe. The timber is in poor condition, including broken vertical timber boards and rotten horizontal wallings. The upper rubble and industrial waste slope presents significant erosion, due to material migration among the breastwork gaps and unstable slopes, exposing the timber tiebacks to corrosion. Whereas no further movement or undermining was observed there is a risk that without further maintenance the breastwork may fail, resulting in partial collapse of the access roadway above. The toe protection seems to be in good condition.



Industrial waste that looks unstable and could collapse over the structure (/4001C03)



Corroded holdings and rotten timber screen – are in poor conditions and requires repairs (/4001C03)

The concrete seawall (/4001C04) extending to Blyth East Pier is generally in fair structural condition, with no visible evidence of movement. However, the toe of the wall as well as the groynes of this section are showing noticeable abrasion from the shingle and cobbles present (agitated by wave action). This abrasion is most significant at the northern section of the wall where the abrasion has led to an approximately 0.5m undercut. The wall presents some vertical cracks, gaps in vertical joints between some adjacent sections and numerous horizontal cracks at the parapet level. The parapet is in very poor condition, presenting large horizontal cracks, most prevalent at access points through the wall's crest. It is at risk of collapse of localised sections and in need of urgent repair. The north end of the parapet presents massive abrasion with some loss of crest level.



Severe undercutting of concrete wall to the north (/4001C04)



Corroded holdings and rotten timber screen – are in poor conditions and requires repairs (/4001C03)

The last asset of this coastal section is the Blyth East Pier (/4001C05). This asset could only be partially inspected during the November 2023 inspection due to the particularly slippery, rocky foreshore. However it generally appeared in fair condition with no noticeable signs of undermining at the toe or movement in the sub structure or superstructure. The flood defence crest level of the structure seems unaltered. Significant issues remain on the timber trestle on top of the wall with missing sections of the deck. The first section of this deck is supported by concrete frames presenting heavy corrosion and concrete spalling. The second section of the deck, supported by long timber legs embedded within the wall, has no handrails and the concrete cover of the timber legs is missing.



Blyth East Pier (/4001C05).



Blyth East Pier (/4001C05).

4. Problems Encountered and Uncertainty in Analysis

All assets were inspected at suitable stages of the tide and in good weather conditions. Therefore, there were no major problems encountered during the inspections.

Some harbour structures were only viewed from a distance (e.g. seaward end of Blyth East Pier) or from the deck. In these cases, vessel-based or underwater inspections are recommended to inform future maintenance and capital works programmes.

5. Conclusions and Recommended Actions

Further to the visual inspection of all NFCDD assets, specific conclusions and recommendations for individual assets are given in **Appendix B**.

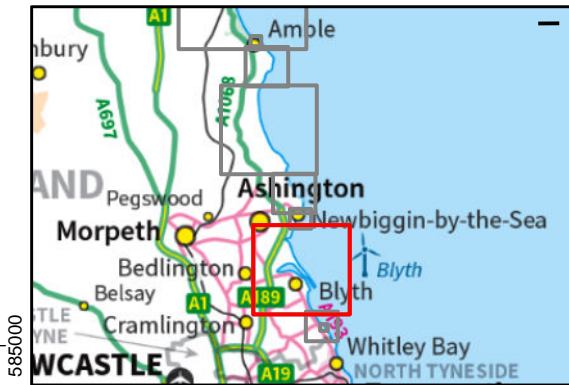
In lieu of a decision for a suitable replacement a replacement for the NFCDD database, all condition assessment data and selected photographs have been uploaded to a SANDS (Shoreline And Nearshore Database System). This includes all data and photographs from the previous inspections since 2002 that were previously held on four separate MS Access Databases that had become obsolete. In order to facilitate easy comparison of new inspections to previous data for each asset a new asset data display form "Northumberland Sea Defence" has been created in SANDS.

The general conclusion from the November 2023 walkover inspection was that the recent named storms have accelerated erosion along Cambois Bay. Beach levels were observed to have notably dropped which has left the backing assets vulnerable to wave attack. Slumping and loss of vegetation were evident across the whole frontage within the undefended lengths of dunes and cliffs. The defended sections appear to have generally remained stable. However, some repairs are still required, notably to the gabions to the north, the exposed sandbags at the cable landing and to the timber access steps.

Appendices

Appendix A

Asset Location Maps



Legend

- Coastal Asset location
- NFCDD Asset Number

© HaskoningDHV UK Ltd.
 Hybrid Reference Layer: Esri UK, Esri, HERE, Garmin, METI/NASA, USGS
 World Imagery: Maxar, Microsoft
 OS Open Rasters: Contains OS data © Crown Copyright and database right 2020

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

Title: **Figure 1 - Map 20**
COASTAL ASSET LOCATIONS
Northumberland County Council Frontage

Report: **Asset Inspection Report**

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:45,000

Co-ordinate system: British National Grid



Appendix B

Asset Condition & Recommendation

Asset Name	Description/comment	Type/desc	Start	End	Sort by N	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
121AA901A3701C03	Exposed earth cliff with rubble foreshore and regular discontinuous low rock armour breakwater.	Breakwater - North Seaton Links	NZ30558607	NZ30378554	586070	561.6	29/11/2023	Royal HaskoningDHV	Continued significant erosion, cliffing and slumping of soft upper cliff along unprotected frontage. Boulders/ rubble along toe. Ongoing collapse of boundary walls onto foreshore. Slipway/ rock armour protection ok. Caravans close to edge	5	6 - 10	Consider formal erosion protection or landward relocation of caravans. Liaison with caravan park.	no repairs
121AA901A3801C01	Low earth embankment/ cliff forming north bank of estuary mouth with sandy foreshore	Embankment - North Bank River Wansbeck	NZ30378554	NZ30008553	585540	396.8	29/11/2023	Royal HaskoningDHV	Sandy foreshore with low boulder embankment topped by well vegetated dunes. Generally stable. Wide spit on northern side of the estuary mouth constraining channel towards the south shore.	2	>20	None.	no repairs
121AA901A3801C02	Low cliff forming south bank of estuary mouth with sandy foreshore	Embankment	NZ29998534	NZ30188528	585340	231.6	29/11/2023	Royal HaskoningDHV	No changes. Good sand strand. The retaining wall is in poor condition however, not failed.	2	>20	None.	no repairs
121AA901A3901C01	Partially vegetated clay cliff with wide sandy beach	Cliff - Cambois Links	NZ30188528	NZ30358501	585280	321.9	29/11/2023	Royal HaskoningDHV	Recent storms have caused beach levels to drop and have reactivated erosion in this location.	3	1 - 5	Monitor.	routine
121AA901A3901C05	Rock armour revetment giving toe protection to vegetated coastal slope	Revetment - Cambois Links	NZ30358501	NZ30518443	585010	600.7	29/11/2023	Royal HaskoningDHV	Slope remains stable and rock armour has no signs of erosion on it. Beach levels dropped significantly in Nov 2023, exposing displaced armour stones at toe. Storm debris evident past crest.	2	>20	Monitor.	routine
121AA901A3901C03	Low, vegetated clay cliff with cobbles at toe and a wide sandy beach	Cliff - Cambois Links	NZ30518443	NZ31038317	584430	1373.1	29/11/2023	Royal HaskoningDHV	Outfalls in very poor condition, low beach levels have revealed further defects. Significant erosion to dune systems with slumping and loss of vegetation. Timber access steps require handrail repairs.	4	>20	Monitor. Remove outfalls	routine
121AA901A3901C04	Low vegetated clay cliff/dunes with beach build up in lee of the Rockers outcrop	Cliff - The Rockers	NZ31038317	NZ31348267	583170	592.3	29/11/2023	Royal HaskoningDHV	Notable erosion to dunes. Sandbag repairs at cable landing have been exposed / damaged and require intervention.	4	6 - 10	Repair sandbag cable landing.	urgent
121AA901A4001C01	Rock armour revetment and rock gabions protecting low soft cliff, with wide sandy beach in front.	Revetment - North Beach	NZ31348267	NZ31778209	582670	727.3	29/11/2023	Royal HaskoningDHV	Rock armour slope seems is too steep. Rock armour has stopped supporting the gabions at some locations. Two gabion baskets have fallen and some others are breaking due to corrosion. Ramp to car park has some undermining issues.	3	>20	Repair gabions. Review slope stability.	routine
121AA901A4001C02	Rock revetment with large units on lower slope, and smaller units on upper slope separated by steel breast work. Scree on beach fronted by rock intertidal platform.	Revetment - Shiny Gripe Lug	NZ31778209	NZ31888197	582090	167.9	29/11/2023	Royal HaskoningDHV	Steel breast has failed in some sections. Upper and lower rocks form a new continued slope, no movements since last inspection. Top of revetment is stable and well vegetated. Some sand accumulation on the toe. Access ramp concrete slab presenting localised undermining.	3	11 - 20	Monitor armour movement at toe. Monitor erosion at crest. Repair localised ramp undermining.	routine
121AA901A4001C03	Composite seawall comprising timber breastwork and concrete and rock armour apron with narrow foreshore	Sea Wall - Alcan Reclaim	NZ31888197	NZ31968188	581970	114.3	29/11/2023	Royal HaskoningDHV	Concrete wall and rock apron in fair condition. Timber screen in poor condition with some missing sections. All steel nails and bolts etc are corroded. Industrial waste is not stable behind the structure, at risk of falling down on top of timber. Rock armour looks new and is in good condition.	4	1 - 5	Repair timber breastwork and stop material migration.	urgent
121AA901A4001C04	Vertical concrete seawall and crestwall with concrete groynes on scree strewn rock foreshore forming part of the Blyth East Pier	Sea Wall - Crab Law	NZ31968188	NZ32138162	581880	322	29/11/2023	Royal HaskoningDHV	Toe presents moderate erosion, not affecting the structure. Concrete wall is in poor condition. The walls ladders are broken and failed; this area was in fair to poor condition. Groynes in poor condition with extensive erosion, still performing however. Parapet in very poor condition with failed sections and large cracks, walkway slabs have missing or broken sections. No evident damage to the area behind.	4	6 - 10	Repairs to cracks. Assessment of crest wall failure.	urgent

Asset Name	Description/comment	Type/desc	Start	End	Sort by N	Length	Inspection Date	Inspector	Comments	Overall Condition	Residual Life	Recommendations	Urgency
121AA901A4001C05	Concrete breakwater with raised timber walkway on crest, founded on bedrock, forming the tip of Blyth East Pier	Breakwater - Blyth East Pier	NZ32138162	NZ32838035	581620	1448	29/11/2023	Royal HaskoningDHV	Concrete inclined wall with raised timber walkway. Timber supported by concrete and timber frames that are in very poor condition. Toe is in good condition and flood defence crest level is unaltered. Timber walkway is missing sections and handrailing.	4	>20	Trestle is ruined, beyond repair, and would require complete refurbishment. Inspect closely the seaward face of the wall to confirm that the timber leg grooves do not pose a structural issue to the wall	no repairs