



## **Cell 1 Regional Coastal Monitoring Programme Walkover Inspection Surveys 2018**

**Sunderland City Council**



**August 2018**

# Sunderland City Council

## Walkover Inspection Surveys 2018

### Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Authorised
1	0	First issue	31/08/2018	<i>N.J. Cooper</i>

## Contents

Disclaimer .....	i
Preamble .....	ii
1. Introduction .....	1
1.1 Study Area .....	1
1.2 Methodology .....	1
2. Overview .....	3
3. Condition Assessment .....	4
3.1 Souter Point to Roker Pier (MA 06) .....	4
3.1.1 The Bents .....	4
3.1.2 Seaburn .....	5
3.1.3 Parsons' Rocks .....	8
3.1.4 Roker .....	9
3.2 Roker Pier to New South Pier (Sunderland Harbour MA 07) .....	11
3.2.1 Roker Pier .....	11
3.2.2 Roker Beach .....	13
3.2.3 Old North Pier .....	14
3.2.4 River Wear to New South Pier .....	16
3.2.5 New South Pier .....	18
3.3 Sunderland Harbour to Pincushion Rocks (MA 08) .....	21
3.3.1 New South Pier to South Outlet .....	21
3.3.2 South Outlet .....	23
3.3.3 Spur Barrier to Hendon Banks Barrier .....	27
3.3.4 Port of Sunderland to Grangetown (Hendon Seawall) .....	33
3.3.5 Hendon Seawall to Ryhope Dene .....	35
4. Comparison with Previous Assessment .....	38
5. Problems Encountered and Uncertainty in Analysis .....	38
6. Conclusions and Recommended Actions .....	39

## Appendices

Appendix A Asset Location Maps

Appendix B Asset Condition & Recommendations

## Disclaimer

Royal HaskoningDHV has prepared this report in accordance with the instructions of our client Scarborough Borough Council (SBC)<sup>1</sup> for the client's sole and specific use. Any other persons who use any information contained herein do so at their own risk. Royal HaskoningDHV has used reasonable skill, care and diligence in the interpretation of data provided to them and accepts no responsibility for the content, quality or accuracy of any Third party reports, monitoring data or further information provided either to them by SBC or, via SBC from a Third party source, for analysis under this term contract.

Data and reports collected as part of the Cell 1 Regional Coastal Monitoring Programme are available to download via the North East Coastal Observatory via the webpage:

[www.northeastcoastalobservatory.org.uk](http://www.northeastcoastalobservatory.org.uk).

The North East Coastal Observatory does not "license" the use of images or data or sign license agreements. The North East Coastal Observatory generally has no objection to the reproduction and use of these materials (aerial photography, wave data, beach surveys, bathymetric surveys, reports), subject to the following conditions:

1. North East Coastal Observatory material may not be used to state or imply the endorsement by North East Coastal Observatory or by any North East Coastal Observatory employee of a commercial product, service, or activity, or used in any manner that might mislead.
2. North East Coastal Observatory should be acknowledged as the source of the material in any use of images and data accessed through this website, please state "Image/Data courtesy of North East Coastal Observatory". We recommend that the caption for any image and data published includes our website, so that others can locate or obtain copies when needed. We always appreciate notification of beneficial uses of images and data within your applications. This will help us continue to maintain these freely available services. Send e-mail to [Robin.Siddle@scarborough.gov.uk](mailto:Robin.Siddle@scarborough.gov.uk)
3. It is unlawful to falsely claim copyright or other rights in North East Coastal Observatory material.
4. North East Coastal Observatory shall in no way be liable for any costs, expenses, claims, or demands arising out of the use of North East Coastal Observatory material by a recipient or a recipient's distributees.
5. North East Coastal Observatory does not indemnify nor hold harmless users of North East Coastal Observatory material, nor release such users from copyright infringement, nor grant exclusive use rights with respect to North East Coastal Observatory material.

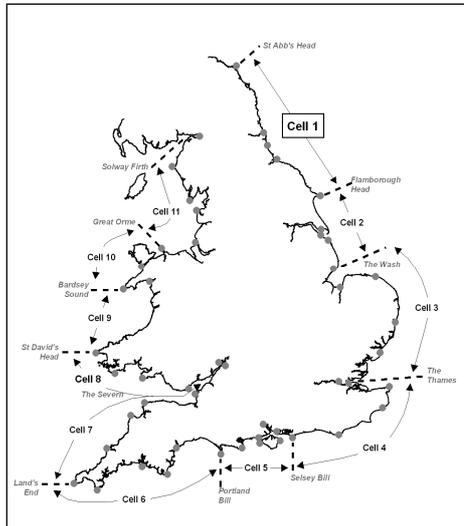
North East Coastal Observatory material is not protected by copyright unless noted (in associated metadata). If copyrighted, permission should be obtained from the copyright owner prior to use. If not copyrighted, North East Coastal Observatory material may be reproduced and distributed without further permission from North East Coastal Observatory.

---

<sup>1</sup> Scarborough Borough Council is acting as client on behalf of all Local Authorities within 'Coastal Cell 1'.

## 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 0-1). 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 till to varying thicknesses, softer rock cliffs, and extensive landslide complexes.



**Figure 0-1 - Sediment Cells in England and Wales**

The work commenced with a three-year monitoring programme in 2008 that was managed by Scarborough Borough Council on behalf of the North East Coastal Group. This initial phase was followed by a five-year programme which started in 2011 and the current five-year programme which started in 2016. The programme is funded by the Environment Agency, working in partnership with the following organisations.



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 sea bed characterisation surveys
- aerial photography
- walkover inspection surveys

Royal HaskoningDHV has been appointed to provide Analytical Services in relation to the Cell 1 Regional Coastal Monitoring Programme 2016 - 2021.

The present report is **Walkover Inspection Surveys 2018** and provides a summary of the main findings from the walkover inspections of Sunderland City Council's frontage that are undertaken once every 2 years.

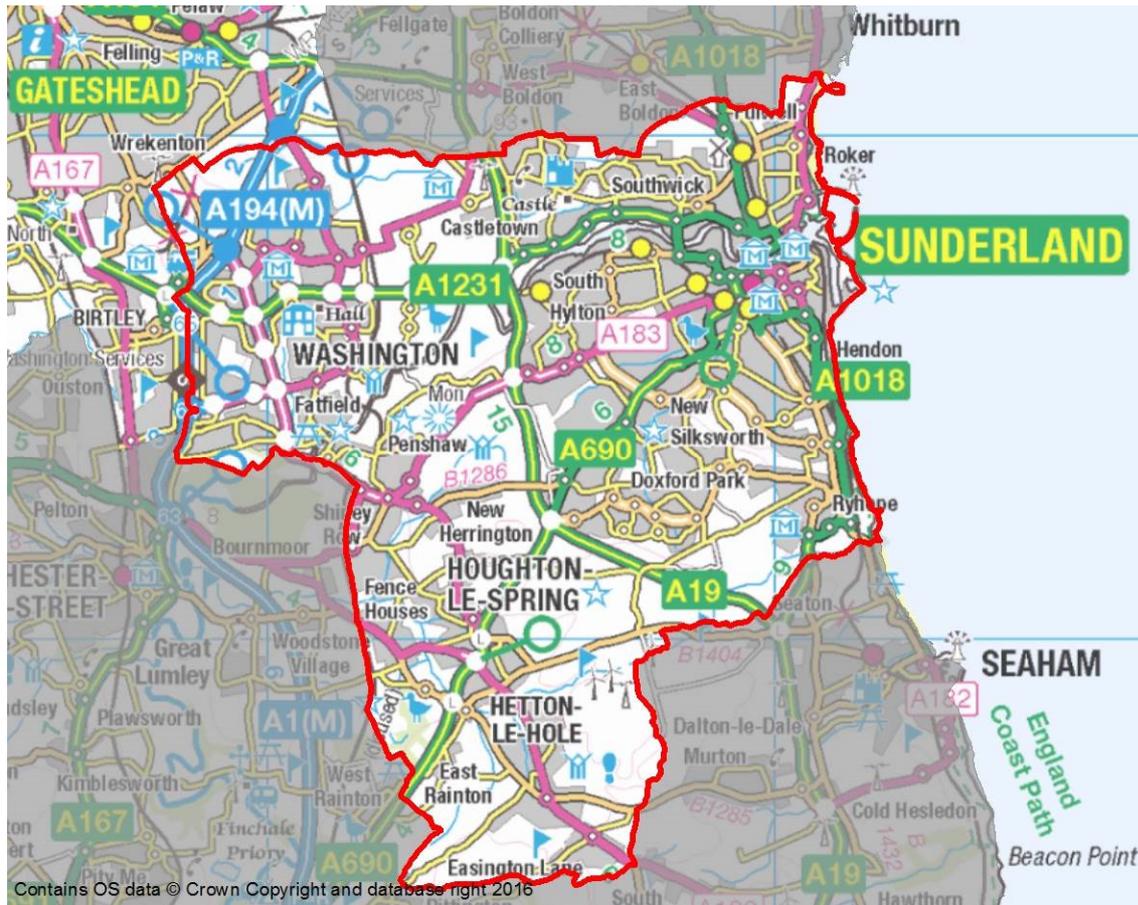
In addition, separate reports are produced for other elements of the programme as and when specific components are undertaken, such as beach profile, topographic and cliff top surveys, wave data collection, bathymetric and sea bed sediment data collection, and aerial photography.

# 1. Introduction

## 1.1 Study Area

Sunderland City Council's frontage is approximately 10km in length overall and extends from The Bents in the north, to Ryhope Dene in the south and is shown in **Figure 1-1**. The frontage includes three management areas, MA6, MA7 and MA8 from the Shoreline Management Plan.

In accordance with previous coastal inspection surveys, this frontage is sub-divided into approximately coastal 36 assets, 31 of which are man-made assets while 5 are natural assets. Detailed maps showing the location of each of these assets are presented in **Appendix A**.



**Figure 1-1: Sunderland City Council study area**

## 1.2 Methodology

This section presents the approach taken by the asset inspectors for the Sunderland City Council coastal frontage.

The walkover inspection surveys for the Sunderland City Council frontage were undertaken on 31<sup>st</sup> May, 1<sup>st</sup> June and 15<sup>th</sup> August 2018. The weather experienced during the inspections was dry and generally fine with occasional sea fog affecting visibility locally.

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.

## 2. Overview

The following significant findings were observed during the 2018 walkover inspection surveys:

- Recent improvements have been made to the Roker Pier by replacing handrailing and construction of new deck.
- There are major defects that require urgent attention on many assets within the Port of Sunderland, particularly the New South Pier, Stonehill Wall seawall and deck south of New South Pier, and the collapsed wall fronting the Sewage Treatment Works.
- Recent repairs were undertaken to the Old North Pier which was breached by storms during March 2018.
- Several assets throughout the frontage would benefit from maintenance repairs.

### 3. Condition Assessment

#### 3.1 Souter Point to Roker Pier (MA 06)

##### 3.1.1 The Bents

Sunderland City Council's coastal frontage starts midway through the SMP2 Management Area 06 at The Bents, near Whitburn.

The most northerly asset is an undefended grassed slope, NFCDD Asset Reference Number 121AB901B0602C01, located landward of the Whitburn Steel rock outcrop. This asset length is continuous across the local authority boundary into South Tyneside Council's coastal responsibilities and consists of a grassy coastal slope fronted by vegetated sand dunes. The dunes appeared stable although since 2016 there appeared to have been slight erosion of dunes to the south as embryo dunes had been eroded. Furthermore, the toe of the access ramp at Whitburn Steel was undercut. However the grassy slope remains wide and stable. The northern part of this asset switches to an eroding clay cliff north of the local authority boundary.



Well vegetated slope, embryonic dune growth eroded since 2016. (Asset Ref No. 121AB901B0602C01)



View towards north boundary, shingle berm at toe. (Asset Ref No. 121AB901B0602C01)



Undercut access ramp at Whitburn Steel (Asset Ref No. 121AB901B0602C01)

The promenade at South Bents, Asset Reference Number 121AB901B0603C01, is fronted by concrete and masonry seawalls. The beach level at the time of the inspection in August 2018 appeared similar to the September 2014 beach levels and the shingle present against the masonry seawall at the southern end was again visible. The concrete section of wall at the northern end was in fair condition although in several areas the concrete is heavily spalled/cracked. Beach sand levels were higher to the north. Erosion was noted to the rear embankment behind benches, and the grouted revetment at the picnic area was notably cracked.

The repaired/replaced coping blocks and handrail of masonry wall at the southern end, previously damaged by storms, appeared to be holding well.



Sandy upper beach surface and dune accretion in front of concrete seawall. (Asset Ref No. 121AB901B0603C01)



Spalled/damaged concrete cope and facing (Asset Ref No. 121AB901B0603C01)



Cracked rear revetment at picnic area (Asset Ref No. 121AB901B0603C01)



Asphalt surface appears in good condition, erosion to rear embankment (Asset Ref No. 121AB901B0603C01)



Exposed aggregate concrete surfacing on promenade behind seawall at southern end. (Asset Ref No. 121AB901B0603C01)



Repaired section of coping blocks. (Asset Ref No. 121AB901B0603C01)

### 3.1.2 Seaburn

The beach level falls to the southern end of Whitburn Sands, exposing more of the seawall. The structure here is formed from masonry with a concrete coping (Asset Ref. No. 121AB901B0603C02). The repairs from storm damage are continuous across this defence, with concrete coping blocks and handrails replaced, as well as new promenade surface landward of the seawall.

There are two concrete outfall structures located immediately seaward of the seawall. The previous inspections in 2010 and 2012 noted there were cracks present at the construction joints around the outfall structures suggesting minor settlement may have occurred. Excessive movement of the outfalls could damage the seawall behind, hence cracks should be repaired and settlement monitored. The beach levels were low (approx. 1m lower than 2016 survey), exposing the toe of wall in several areas.



Repaired concrete coping above masonry seawall.  
(Asset Ref No. 121AB901B0603C02)



Repaired concrete coping above outfall structure.  
(Asset Ref No. 121AB901B0603C02)



Exposed aggregate concrete surfacing at southern end.  
(Asset Ref No. 121AB901B0603C02)



Low beach levels exposing undercut toe of access steps adjacent the Fat Buddha restaurant.  
(Asset Ref No. 121AB901B0603C02)

The wall between Dykelands Road and the roundabout at Seaburn Terrace (Asset Ref No. 121AB901B0603C03) was in fair overall condition. Similar to previous inspections, rust staining was present throughout the crest wall although this is likely to have arisen from fixings from previous benches. There was also extensive cracking to the crest wall, although the seaward masonry wall face was generally in fair condition.



Cracking in seaward side of crest wall  
(Asset Ref. No. 121AB901B0603C03)

Rust staining at fixings from previous seats,  
cracking in crest wall.  
(Asset Ref. No. 121AB901B0603C03)

The beach levels were lower than 2016, exposing the toe of the wall and evidence of previous bag-work repairs. Extensive marine growth covers the toe of the wall, however it appears these bag-work repairs may need extending to prevent further undermining and loss of fill.

The steps at Seaburn Terrace roundabout are generally in fair condition, with hand railing failed and steps heavily abraded exposing reinforcement in the wing-wall.



Abraded/spalled nosing of access steps at  
Dykeland Road roundabout.  
(Asset Ref. No. 121AB901B0603C03)



Low beach levels exposing open joints at toe of  
wall (Asset Ref. No. 121AB901B0603C03)



Open joints and void at toe of wall.  
(Asset Ref. No. 121AB901B0603C03)



Previous bag-work repairs exposed, local  
voiding at toe  
(Asset Ref. No. 121AB901B0603C03)



Recently replaced handrails at Seaburn  
Terrace roundabout steps, algae removed  
(Asset Ref. No. 121AB901B0603C03 /  
B0604C01)



Recently constructed seawall infill section  
adjacent to steps at Seaburn Terrace  
(Asset Ref. No. 121AB901B0603C03)

The seawall south of Seaburn Terrace was in fair condition, except for a section of coping which had broken off causing chloride staining. Across the seawall there were small areas of rust/chloride staining. Beach levels were lower than the previous inspection exposing the toe beam. The landward concrete retaining wall appeared to be in good condition.



Beach levels similar to September 2014.  
(Asset Ref. No. 121AB901B0604C01)



Damaged section of coping and chloride staining (Asset Ref. No. 121AB901B0604C01)

### 3.1.3 Parsons' Rocks

The masonry seawall backing Parson's Rocks is in fair condition with some open joints and occasional damaged blocks. The masonry structure ties in with the elevated limestone rock outcrop which is abrading and eroding in places, for example at the old steps just north of the point and on the southern flank where there is a void starting to extend below the promenade. Maintenance repairs are recommended to prevent any damage from escalating.



View southwards from Parsons Rocks, seawall in fair condition.  
(Asset Ref. No. 121AB901B0604C02)



Eroded natural rock at access steps to Parsons Rocks (access to steps blocked by handrail).  
(Asset Ref. No. 121AB901B0604C02)



Remains of previous access steps breaking up onto foreshore. (Asset Ref. No. 121AB901B0604C02)



Asphalt surface replaced locally at promenade (Asset Ref. No. 121AB901B0604C02)



Eroded limestone outcrop void beneath promenade at south of Parsons Rocks. (Asset Ref. No. 121AB901B0604C02)



Damage to coping on ramp south of Parsons Rocks. (Asset Ref. No. 121AB901B0604C02)

The grouted stone revetment landward of the promenade around Roker Cliff Park has voids and damage recently infilled with grout.



Recently infilled voids in grouted revetment (Asset Ref. No. 121AB901B0604C02)

### 3.1.4 Roker

South of Parsons' Rocks the high masonry wall around the headland extending south of the ravine at Roker Park (Asset Ref. No. 121AB901B0605C01) was in generally good condition, with minor mortar loss, and cracked blocks in places. The natural cliff above appeared to be relatively stable. At the most exposed section where the wall is most seaward, before the return to Roker Park, there is a hole in the wall, which has extended since the previous inspection in 2016. This should be repaired to prevent the damage spreading further.



Masonry wall generally in good condition  
(Asset Ref. No. 121AB901B0605C01)



Hole at missing block has extended since 2016  
and longitudinal crack has formed.  
(Asset Ref. No. 121AB901B0605C01)

The low level concrete encasing wall fronting Marine Walk was in fair to good condition following improvement works a few years ago. Vertical cracks in the encasing concrete of the northern section were noted in the majority of blocks. Improvements to the promenade were undertaken in 2012. At the north end near the Roker Park entrance, beach levels appeared higher than 2016, it was notable that sand had been excavated from in front of 3No. pipes which discharge onto the beach.



Low concrete encased wall at Marine Walk in  
fair to good condition.  
(Asset Ref. No. 121AB901B0605C02)



Sand noted to have been excavated/cleared  
from in front of outfall pipes.  
(Asset Ref. No. 121AB901B0605C02)



Damaged concrete access steps needing  
repair. (Asset Ref. No. 121AB901B0605C02)



Southern section of masonry wall protected by  
wide beach in good overall condition.  
(Asset Ref. No. 121AB901B0605C02)



Damage to coping stone, similar to 2016.  
(Asset Ref. No. 121AB901B0605C02)

### **3.2 Roker Pier to New South Pier (Sunderland Harbour MA 07)**

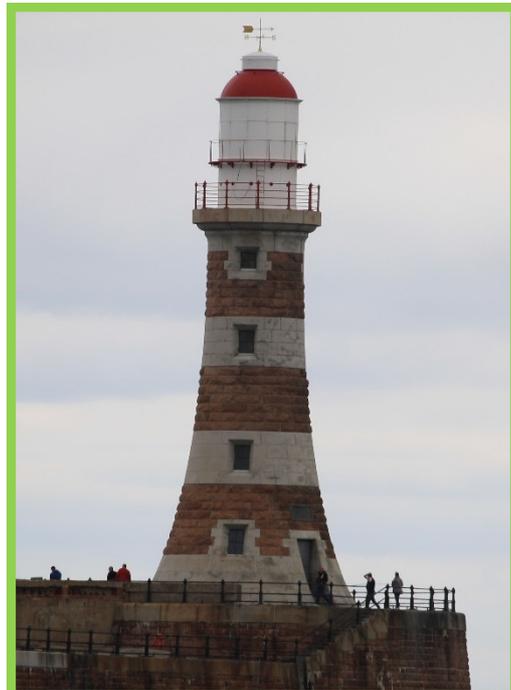
#### **3.2.1 Roker Pier**

Roker Pier is located to the north of the mouth of the River Wear. Refurbishment works were undertaken to the pier in 2014, this involved foundation repairs including placing underwater concrete, concrete resurfacing of the deck slab, repointing joints, and, restoration of the lighthouse. A further phase has been recently completed which included replacement/repairs to handrailing and damaged coping damaged by storms, and restoration of the pier tunnel to allow visits by the public.

The pier structure appeared generally in good condition, with minor defects noted. On both faces of the pier there was occasional damage to blocks and coping stones, and some open joints. Occasional vertical cracks were noted through the height of the structure indicating potential settlement, these cracks should be monitored. Inspection by boat, and potential underwater surveys would be recommended to identify potential issues at the toe of the structure.



Northern (outer) face of pier  
(Asset Ref. No. 121AB901B0702C04)



Recently refurbished lighthouse.  
(Asset Ref. No. 121AB901B0702C04)



Recently constructed concrete deck  
(Asset Ref. No. 121AB901B0702C04)



Concrete structure adjacent lighthouse heavily  
abraded on northern and top face.  
(Asset Ref. No. 121AB901B0702C04)



Roker Pier northern (inner) face, vertical cracks and open joints at toe  
(Asset Ref. No. 121AB901B0702C04)



Recently replaced handrail and coping blocks.  
(Asset Ref. No. 121AB901B0702C04)



Potential settlement crack towards toe of  
northern face  
(Asset Ref. No. 121AB901B0702C04)

The masonry wall at the northern side of the root of the pier (Asset Ref. No. 121AB901B0702C05) appeared in fair to good condition, although there was localised abrasion and loss of mortar in joints on both the seaward and landward faces.

The masonry splash wall at the southern side of the root of the pier (Asset Ref. No. 121AB901B0702C05), appeared in fair condition although there were several sections of damaged concrete coping and the masonry facing appeared heavily weathered/abraded. Beach levels were typically approx. 1m lower than 2016.



View on northern side of masonry wall at root of pier – localised abrasion and mortar loss. (Asset Ref. No. 121AB901B0702C05)



Masonry splash wall at southern root of pier – sections of damaged coping and weathered masonry. (Asset Ref. No. 121AB901B0702C05)

### 3.2.2 Roker Beach

South of Roker Pier the masonry and concrete seawall, asset 121AB901B0702C01 is in fair overall condition with evidence of previous patch repairs and multiple horizontal cracks in the concrete sections as seen in previous inspections. The promenade surface appeared to be in fair condition. In some areas, spalling has taken place between the horizontal cracks. The level of the wide fronting beach protecting this wall appeared similar to that seen in 2016.



Patch repairs and horizontal cracks in concrete wall. (Asset Ref. No. 121AB901B0702C01)



Example of spalling between horizontal cracking (Asset Ref. No. 121AB901B0702C01)

The rock armour revetment to the south of the public car park appeared to be in good condition. There appeared to be good interlock between the rocks, and an even crest level. As the rock was placed in front of the seawall, it was not possible to inspect the face of the wall. The promenade crest appeared in good condition.

The rock armour revetment was narrower at the northern end adjacent to the lifeboat slipway. Beach levels were lower than 2016 at the slipway, exposing a void/undercutting at the toe.



Rock armour and promenade crest in good condition. (Asset Ref. No. 121AB901B0702C02)



Void/undercutting at toe of slipway. (Asset Ref. No. 121AB901B0702C02)

### 3.2.3 Old North Pier

The 2010 report noted that the Old North Pier is not included in Sunderland City Council's revenue or capital programmes for coastal defences as it is classified as a river wall rather than coastal defence. As noted in the 2010 report, the Old North Pier structure will act to retain beach material to the north and act to reduce sediment passing into the navigation channel through the harbour entrance. The structure is included in the present condition assessment for reference.

The Old North Pier was breached during storms in March 2018 resulting in washout of the rubble infill into the navigation channel of the port. The structure has subsequently been repaired by infilling the breached/voided area with armourstone and grout, and previously reported voids have been infilled with concrete.

The structure remains partially fenced off to members of the public with signs describing the structure as unsafe and therefore full assessment of the structure was not possible.

Generally, the Old North Pier appeared in similar condition to that reported in previous inspections. There was missing concrete and masonry from both sides of the grouted revetment that form the north face, voids towards the toe of the north face, and several missing blocks at the seaward end. The masonry wall forming the southern face appeared to also have several missing blocks.



Northern face of Old North Pier, voids at toe (Asset Ref. No. 121AB901B0702C03)



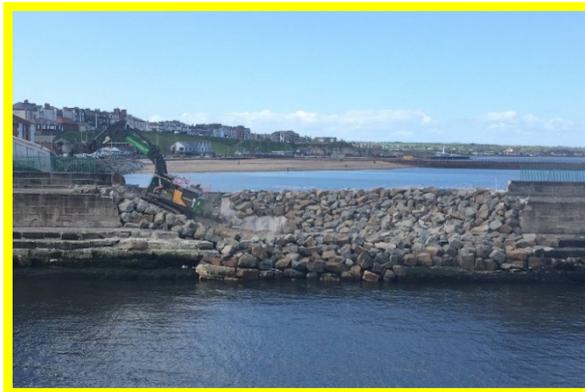
Recently constructed haulage path on crest of Old North Pier for delivery of rock repairs (Asset Ref. No. 121AB901B0702C03)



Recent breached infilled with rock armour and grout. (Asset Ref. No. 121AB901B0702C03)



Missing blocks at seaward end (Asset Ref. No. 121AB901B0702C03)



Old North Pier undergoing repair works at breach, taken 10 May 2018. (Asset Ref. No. 121AB901B0702C03)



Collapsing masonry on southern face (Asset Ref. No. 121AB901B0702C03)



Old North Pier southern face (Asset Ref. No. 121AB901B0702C03)

Upstream of the Old North Pier adjacent to the yachting club is "Rat House Corner", a popular fishing spot, where the defence is comprised of sheet pile wall with concrete capping beam. It was not possible to visually assess the condition of the sheet piles, however the concrete capping beam appeared in fair condition with small areas of damage at corners.



Damage to concrete coping at “Rat House Corner”. (Asset Ref. No. 121AB901B0702C03)



Promenade at “Rat House Corner” in fair condition (Asset Ref. 121AB901B0702C03)

### 3.2.4 River Wear to New South Pier

The frontage to the south of the mouth of the River Wear is inaccessible to members of the public as it is located within the restricted area of the Port of Sunderland. Access to the port for purposes of inspections was arranged through Sunderland City Council, who own and operate the port.

The northernmost structure consists of a rock armour revetment which remains in fair overall condition. The rock armour is loosely placed with some gaps towards its toe and in places lacks interlock, the profiling of the rock armour is fairly uniform as shown in the image following.

The crest section of rock is grouted with concrete and is generally in fair condition except for the loss of several rocks from the concrete grout mattress at the crest of the defence. There is a notable depression in the rock armour towards the south end of the revetment, and there is a continuous low spot on the landward side of the concrete crest, likely due to wave overtopping. The revetment ties into a sheet piled river/navigational wall to the north and a masonry sea wall with a precast concrete recurve crest to the south, which extends to the rear as a secondary wall. It is recommended that localised reprofiling of the rock armour at the south of the revetment is considered, in addition to re-grouting of damage to the crest. Potential microbial induced corrosion (MIC) was noted to sheet piling forming the navigational wall at the north, which would reduce the structural capacity of piles.

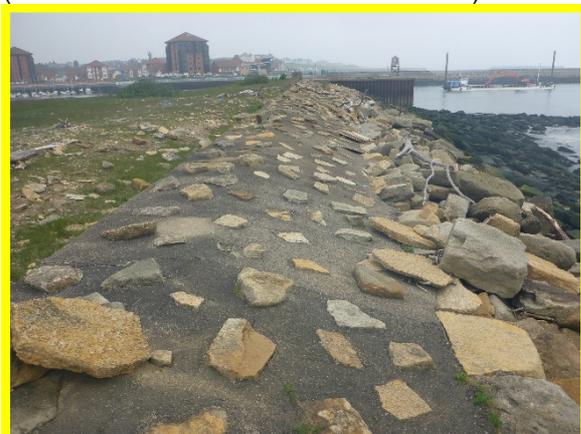
The secondary wall (towards the south end) was inspected only at the seaward end, and is in fair condition. Minor spalling and cracking of the concrete and spalling of the surface of the concrete walkway to the rear was noted. The very seaward end has reinforcement bars standing vertically from the top of the concrete wall, it appears these were placed to allow the continuation of a boundary wall which was not completed. Key changes to the asset since the previous inspection in September 2016, were loss of blocks from the base of the seaward facing nose, and longitudinal open joints formed at the seaward face of the rear wall.



Staining at toe of sheet pile river navigational wall at north end potentially indicating microbial induced corrosion (MIC) reducing structural capacity  
(Asset Ref. No. 121AB901BO703C03)



View of rock revetment from north showing loosely placed armour  
(Asset Ref. No. 121AB901BO703C03)



View of revetment crest from south.  
(Asset Ref. No. 121AB901BO703C03)



Low spot on landward side of concrete crest  
(Asset Ref. No. 121AB901BO703C03)

The masonry and concrete sea wall to the south which links into the north face of the New South Pier is in fair condition, however the embankment to the rear is in poor condition due to erosion damage from wave overtopping, therefore the asset is classified as poor condition overall.

The masonry wall appears in similar condition to 2016 and 2010-2014, although further blocks have been lost from the toe at the northern end, leading to increased risk of outflanking causing the wall to start unravelling. As noted in previous reports, the concrete apron to the rear of the wall (south part only) has sections of concrete missing due to wave overtopping. Rubble protecting the rear embankment has further degraded and provides little protection against wave overtopping. There has been further erosion to the rear flood embankment, with the seaward slope of the embankment eroded back to the crest in places.



Extensive crest and rear embankment damage due to wave overtopping.  
(Asset Ref. No. 121AB901BO703C02)



Masonry wall in fair condition except for missing blocks at North end.  
(Asset Ref. No. 121AB901BO703C02)

As recommended in previous reports, the surfacing to the rear should be repaired / replaced. Voids in the rubble surface immediately behind the wall should be filled, in order to avoid wave overtopping causing further erosion and pooling behind the wall destabilising the structure. It is recommended the rear embankment is reprofiled and repaired where necessary, particularly at its southernmost extent. Alternatively, a crest wave return wall could be constructed to prevent overtopping. Minor repairs to the concrete apron and coping, and replacement of missing masonry blocks is also recommended.

### 3.2.5 New South Pier

Generally, the New South Pier appeared in similar condition to previous inspections although significant deterioration has taken place in several localised areas caused by storms in March 2018.

Several sections of the lower deck were missing concrete deck slabs, and stone coping beam was missing for approx. 50m length of the landward side of the lower deck. Furthermore extensive localised damage to coping stones on the upper and lower deck was noted.

Minor defects of cracking / spalling to concrete slabs and loss of mortar between masonry blocks were present locally throughout the structure.

As noted in previous reports there are a number of large blocks missing at the seaward end of the pier, although this is not new damage. It is however advised that the end of the pier and damage to coping stones and deck slabs mentioned above, are repaired in order to prevent further degradation of the structure.

There were no signs of global movement or distress to indicate major problems with the foundations of the structure, but an underwater survey is recommended, particularly towards the seaward end as wave action within the central chamber was noted in the 2010 report indicating that there must be voids in the structure.

Cable stays supporting the navigation light have been broken since 2016, leaving the navigation light structure in a precarious position at risk of toppling.

Along the southern face of the wall between the upper and lower deck there are localised sections of heavily abraded brickwork.

The upper deck of the breakwater was not inspected at its seaward end due to fall from height risk, and the seaward face of the breakwater was inspected at a distance from the south (approximately 1/3 of its length).

Two open water-filled (likely services) chambers were identified in the lower deck of the breakwater posing a significant fall/entrapment risk. These open chambers were reported to Port Authorities and should be covered.



Voids in blockwork of upper deck appear to have been repaired although further damage has taken place. (Asset Ref. No. 121AB901B0703C01)



View of south face of wall from land. (Asset Ref. No. 121AB901B0703C01)



Damage to lower deck level and cope blocks. (Asset Ref. No. 121AB901B0703C01)



Corroded navigation light column unsupported and leaning precariously. (Asset Ref. No. 121AB901B0703C01)



Open chambers on deck of pier posing fall/entrapment risk. (Asset Ref. No. 121AB901B0703C01)

### 3.3 Sunderland Harbour to Pincushion Rocks (MA 08)

#### 3.3.1 New South Pier to South Outlet

The seawall to the south of New South Pier, Stonehill Wall, (Asset Ref. No. 121AB901B0801C03) is a masonry wall continuous with the southern face of New South Pier.

Significant deterioration has occurred to this structure since the 2016 survey:

- The cope stones have been lost, the deck slab is broken up into many pieces (see photo below right) and infill material is being washed out.
- The splash wall to the rear has broken up into several sections.

Although the masonry wall facing appears generally in a similar condition to the 2016 survey, overall integrity of the structure is likely compromised due to material washout from the deck.

- Further blocks have been lost at an area where blocks were identified missing in 2016, and an open horizontal joint, approximately 10m length remains (see image below left).
- A previous (2010) void at the base of the wall remains covered by rock (see image below left), it could not be determined if the void has been filled.
- Missing blocks and several open joints were noted in the masonry wall during inspection by foot at southern end of structure.

The rock armour to the southern part of the wall appears in fair condition, however some depletion from 2016 is evident. The beach level appears to be lower than 2016 with more of the base of the wall exposed.

It is recommended a capital scheme is undertaken to replace/repair the structure.



Previous void covered with rock (left),  
Further missing blocks and open joint (right).  
(Asset Ref. No. B901B0801C03)



Deck slab and rear wall broken up.  
(Asset Ref. No. B901B0801C03)



Missing blocks and open joints at toe of masonry wall. (Asset Ref. No. B901B0801C03)



Rock armour in fair condition although gaps present. (Asset Ref. No. B901B0801C03)

South of the seawall there are two lengths of rock armour sea defence (121AB901B0801C02 and 121AB901B0801C06) with the remains of a collapsed concrete groyne (121AB901B0801C01) between. The rock revetment (mixed with some concrete blocks and rubble/debris) remains in fair condition with some minor displacement of material and local slumping of crest.



Rock/rubble revetment north of derelict groyne. (Asset Ref. No.121AB901B0801C02)



Uneven crest level of revetment. (Asset Ref. No.121AB901B0801C02)

The concrete groyne appeared in a similar derelict condition to that reported in 2016 and previously. A section of upstanding groyne appears at risk of toppling in the short to medium term. The remains do not appear to have adverse effects on the surrounding rock armour and although the beach has accreted since 2010, the groyne is considered to have a negligible effect on wave energy and sediment transport along the frontage. A degree of protection will be provided by the South Rocks outcrop, erosion of which is possibly the source of the shingle accumulation on the northern part of the beach.



Derelict concrete groyne from north.  
(Asset Ref. No. 121AB901B0801C01)



Derelict concrete groyne from south.  
(Asset Ref. No. 121AB901B0801C01)

South of the groyne is another section of rock revetment in fair condition, with interlocked rocks although crest remains uneven similar to section north of derelict groyne.

### 3.3.2 South Outlet

The South Outlet is formed between the North East Pier and the South West Breakwater. The assets are in generally poor condition and have experienced further degradation since the 2016 inspections. The size of the structures means that they will continue to provide some protection to the headland even if no remedial action or maintenance program is undertaken.

As noted in the previous reports, to ensure that the protection provided is sufficient for the needs of the Port a strategy should be developed for the South Outlet defences, which incorporates the development plans of the Port. The South West Breakwater requires extensive remedial work and the North East Pier requires major refurbishment or possible replacement although the importance of maintaining the South Outlet is unlikely to be significant enough to justify the significant capital expenditure required unless it were associated with redevelopment of the area behind.

The North East Pier is split into 3 asset lengths. The seaward defence to the north is asset 121AB901B0801C05, which consists of a variety of derelict concrete, masonry and sheet pile structures with limited armouring with mixed rock and concrete blocks supplemented by a bund of stacked rock and demolition waste at the crest. This is generally in poor condition, see below, and if the land to the rear is to be redeveloped it is recommended that additional rock armour placed to improve the standard of defence.



Derelict former defence structures with stacked bund of rock armour at crest.  
(Asset Ref. 121AB901B0801C05)



Rock armour at crest of derelict former defence structures.  
(Asset Ref. No. 121AB901B0801C05)

At the inner end of the North East Pier is asset B901B0801C07 and asset B901B0801C04 which is located at the outer end of the pier. The inner end of the pier remains in similar condition to the 2014 inspection. The seaward facing concrete structures are heavily abraded exposing reinforcement, and the innermost buttress has become detached from the main structure. The deck of the pier is heavily spalled with cracking throughout. The inner end of the pier is backed by rubble armour which is in fair condition.

The seaward section of North East Pier, including the roundhead and both faces is asset 121AB901B0801C04, and is in very poor condition. The deck remains severely abraded with missing sections and exposed reinforcement observed throughout.

As reported in previous years the roundhead of the structure has become detached, leaving the exposed nose of the pier vulnerable to wave attack and causing ongoing loss of material from the end of the breakwater. The nose of the pier appears to have undercut further since the 2016 inspection and it appears a further section of the pier is likely to detach in the short term.



Buttress detached from main structure  
(Asset Ref. No. 121B901B0801C07)



Heavily abraded deck. (Asset Ref. No. 121B901B0801C04)



Nose of pier undercut further than 2016.  
(Asset Ref. No. 121B901B0801C04)



North East Pier viewed from south.  
(Asset Ref. No. 121B901B0801C04)

The South Outlet basin has been partly filled and protected with random tipped rubble which is comprised of broken sections of concrete slabs, masonry, rock and debris see images below. Although this affords a degree of protection, it is not a formal defence so is assessed as poor condition. There are three asset lengths in NFCDD, which are from north to south 121AB901B0801C08, 121AB901B0802C07 and 121AB901B0802C06. All three assets in this area appear to be in similar poor condition to the 2016 report. Gullying was noted along the crest of asset 121AB901B0801C08, which may be caused by surface water runoff from land to the rear.

The heavily corroded sheet pile wall at asset 121AB901B0802C07 crumbled when touched. However, the likelihood of water reaching the structure is low due to its distance from the shoreline and height above the water line.



Tipped rubble at northern end of South Outlet basin. (Asset Ref. No. 121AB901B0801C08)



Sheet pile wall at south-west side of South Outlet. (Asset Ref. No. 121AB901B0802C07)



Heavily corroded sheet pile wall, taken 2016 (Asset Ref. No. 121AB901B0802C07).



South side of basin taken from northern end of south outlet. (Asset Ref. No.121B901B02C06)

The South West Breakwater was in similar condition as past inspections. As described in the 2010 to 2016 reports the South West Breakwater is in a derelict condition, with significant damage to and loss of deck sections, displaced core blocks to landward (north) side, missing sections of concrete blockwork and severe damage.



Collapse on landward side of SW Breakwater similar to 2016. (Asset Ref. 121AB901B0802C05)



Displaced core blocks of SW Breakwater. (Asset Ref. No. 121AB901B0802C05)



Missing section at seaward side of SW Breakwater. (Asset Ref. 121AB901B0802C05)



Demolition waste tipped on landward side, damaged blocks. (Asset Ref. 121AB901B0802C05)

### 3.3.3 Spur Barrier to Hendon Banks Barrier

Located to the south of the South West Breakwater is a large concrete seawall with sheet piled toe and set back crest wall, asset 121AB901B0802C04, approximately 500m length, terminating at the north end of the sewage treatment works. The asset was in fair overall condition, with localised damage and cracking/spalling of concrete and missing sealant in some construction joints.

Viewed from a distance, the toe piles appear corroded and abraded, and some piles had become detached from the adjacent concrete toe. An underwater inspection and boat survey is recommended as voids through the piles could lead to loss of fill material and destabilisation of the wall. Flood boards noted in the 2014 and 2016 reports remain, corrosion was noted to fixing bolts.



North end of Spur Barrier upper wall.  
(Asset Ref. No. 121AB901B0802C04)



Cracking and spalling of upper sea wall.  
(Asset Ref. No. 121AB901B0802C04)



Spalling and localised damage to Spur Barrier wall.  
(Asset Ref. No. 121AB901B0802C04)



Corroded/abraded sheet pile wall at toe. (Asset Ref. No. 121AB901B0802C04)



Undermining of upper seawall at south end. (Asset Ref. No. 121AB901B0802C04)

Seaward of the sewage treatment works there is a relatively new concrete boundary wall, which remains in good condition. However, this is fronted by a section of seawall, asset 121AB901B0802C03, which is in very poor (failing) condition. The crest apron consists of broken rubble, rock, and demolition waste, hence during a storm wave overtopping could easily displace this material and undermine the boundary wall.

The old in-situ concrete seawall has limited protection from rock armour at the toe. The most northern part of the sea wall appears to have collapsed and been filled in with rock/rubble armour, image lower left. There appears to have been a loss of the defence level at the northern end of the asset, and the asset to the north (121AB901B0802C04) is being undercut. As noted in the previous reports, it is recommended that a capital improvement scheme is considered for this section due to the high value infrastructure located to the rear.



Sea wall in similar condition to 2016. (Asset Ref. No. 121B901B0802C03)



Rock armour in similar poor condition to 2016. (Asset Ref. No. 121B901B0802C03)



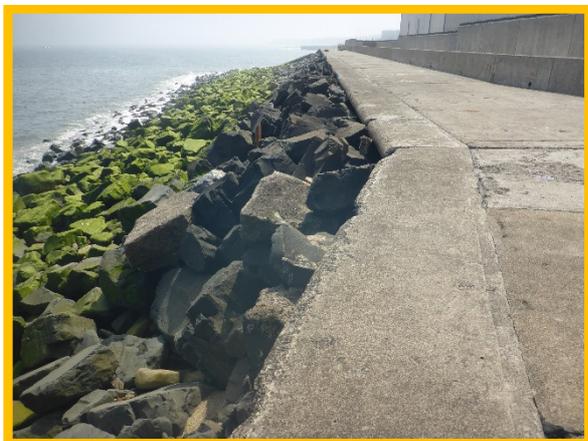
North end where rock/rubble crest has collapsed since 2016.  
(Asset Ref. No. 121B901B0802C03)



Concrete boundary wall with unprotected crest apron. (Asset Ref. No. 121B901B0802C03)

The defence protecting the Sewage Treatment Works, asset 121AB901B0802C02, is in fair overall condition but some of the rock armour appears small sized and inadequately interlocked, with movement during storms causing damage to the concrete wall and deck slab during storms. Several rocks remained on the crest slab similar to previous inspection. It is recommended that the armour is re-profiled and topped up with larger armour and better interlock. There was evidence of damage to the seaward edge of the crest slab and cope blocks along the length of the structure.

At the south end of this section the rock armour terminates at a concrete groyne which extends from the defence 121AB901B0802C01 to the south, with the toe protected by sheet piles and some rock armour. There appeared to be some undercutting and missing masonry which was also noted in the 2016 inspection that should be repaired, re-profiling and topping up of rock armour to the south side is recommended.



Damaged cope blocks  
(Asset Ref. 121AB901B0802C02)



Unprofiled rock armour of varying (small) sizes, damaged cope.  
(Asset Ref. No. 121AB901B0802C02)



Displaced rock damaging deck slab and rear splash wall exposing reinforcement.  
(Asset Ref. No. 121AB901B0802C02)



Overtopping debris between splash wall and rear boundary wall  
(Asset Ref. No. 121AB901B0802C02)

The most southerly defence within the port area is asset 121AB901B0802C01, which remains in poor condition similar to 2016. Several sections of rear wall appeared to have been replaced recently, and replacement of a section was being undertaken during the 2018 survey. Some crest wall sections are spalled and heavily stained with rust. The south facing wall adjacent the sewage treatment works has several missing masonry blocks.

The toe piles remain heavily corroded and abraded with holes through. A length of cope beam at has been lost towards the south, as image below. Cracking between crest slab and cope, shown in image below, indicates that sections of cope and deck could be lost in storms. It is recommended to consider placing rock armour in front of this wall and to repair damage.

There has been significant damage to the concrete deck slab around several outfall drains since 2016 so that in parts the drains are discharging directly into fill material behind the concrete seawall.



Missing facing masonry requires attention.  
(Asset Ref. No. 121AB901B0802C01)



Extensive cracking and spalling of deck slab.  
(Asset Ref. No. 121AB901B0802C01)



Example of damaged deck slab at outfall drain leading to washout of infill material. (Asset Ref. No. 121AB901B0802C01)



Missing cope beam and corroded / holed sheet pile wall toe. (Asset Ref. 121AB901B0802C01)



Works ongoing to replace sections of rear wall. (Asset Ref. No. 121AB901B0802C01)



Sections of recently replaced rear wall. (Asset Ref. No. 121AB901B0802C01)

The breakwater marking the southern extent of the Port of Sunderland continues to fail at the seaward end, but remains generally in a similar condition to that reported in 2008 to 2016. In NFCDD this structure forms part of the asset length to the south, 121AB901B0803C02.



Breakwater with nose detached, from north side. (Asset Ref. No. 121AB901B0803C02.)



Breakwater with nose detached, from south side.(Asset Ref. No. 121AB901B0803C02)



Spalled deck surface of breakwater.  
(Asset Ref. No. 121AB901B0803C02)

### 3.3.4 Port of Sunderland to Grangetown (Hendon Seawall)

South of the port boundary is the concrete Hendon Seawall, Asset Ref. No. 121AB901B0803C02, which was in fair overall condition, similar to 2016. Rock armour protection has been placed in front of the wall in several sections and this was in good condition with appropriate voids and interlock between units, although it appeared smaller rocks may have moved locally down the beach.

There are twelve concrete groynes on the foreshore which appear to be having some limited impact on the control of sediment movement, see image bottom left. Beach levels were generally higher than the 2016 survey. Each groyne has access points through the structures on the upper foreshore. The groynes are in fair condition, but are notably abraded towards the inner end.

There is a concrete sewage outflow pipe that runs from the beach out to sea, this is protected by a pile wall which is heavily corroded / abraded, however the concrete appears to be in fair condition.

Steel toe piling was visible along significant lengths of the wall where it is not protected by rock armour, but the piles were heavily corroded and abraded with limited remaining life. Furthermore, the railings on the ramp down to the beach towards the northern end of the asset have failed due to corrosion and/or impact damage.



Rock armour generally in good condition.  
(Asset Ref. No. 121AB901B0803C02)



Failed railings at northern end.  
(Asset Ref. No. 121AB901B0803C02)



Shingle accumulated at landward end of groyne, approx. 1m height.  
(Asset Ref. No. 121AB901B0803C02)



Concrete sewage outflow pipe in fair condition, heavily corroded / abraded at pile head.  
(Asset Ref. No. 121AB901B0803C02)

Similar to 2016, sealant was missing from construction joints in the concrete slabs in a number of locations. Minor spalling was evident around drainage holes with exposed reinforcement in the crest wall to the southern part of the defence. There was also abrasion evident to the front face of the wall in places as shown below. Additional rock armour to protect the failing piles and abraded wall should be considered in future.

At the southern end of the asset where the seawall is backed by cliffs, there is a localised slumped overlying till layer and gullying possibly due to surface water overflow. The slipway at the southern end is in fair condition with some cracking and spalling along beams. The rock armour surrounding the southern slipway is in overall good condition.



Heavily abraded and corroded steel toe piling.  
(Asset Ref. No. 121AB901B0803C02)



Seawall abraded exposing reinforcement.  
(Asset Ref. No. 121AB901B0803C02)



Localised gullying of slope to rear of seawall  
(Asset Ref. No. 121AB901B0803C02).

### 3.3.5 Hendon Seawall to Ryhope Dene

The natural coastal frontage extending from the southern end of the Hendon Seawall to Ryhope Dene comprises of Magnesian Limestone cliffs overlain by softer glacial till.

Generally, the cliffs are relatively stable with occasional local minor rock falls in the limestone or slumps in the till. In places along this frontage there are caves, arches and sea stacks present.



Sea stack near Ryhope Village Dene  
(Asset Ref. No. 121AB901B0804C02)



Sea stack at Pincushion  
(Asset Ref. No. 121AB901B0804C02)

There were signs of recent localised slumping and tension cracks present in the cliff face at Salterfen Rocks.

Further to the south, it was noted the concrete surround to the outfall structure at Ryhope Nook has been undercut. Ongoing erosion was noted to the footpath/steps at Ryhope Nook making steps unfit for access.



Recent slumping at Salterfen Rocks  
(Asset Ref. No. 121AB901B0804C03)



Undercutting to Ryhope Nook outfall.  
(Asset Ref. No. 121AB901B0804C03)



Erosion to steps at Ryhope Nook  
(Asset Ref. No. 121AB901B0804C03)

The cliffs become more unstable along Halliwell Banks (/0804C02, between Ryhope Village Dene and Ryhope Dene). Just south of Ryhope Village Dene, several debris lobes and slumps can be seen in places over the full height of the cliffs and water seepage through the cliffs is frequent. There are several precipitous sections where there are cracks and overhangs, with considerable water seepage adding to the likelihood of further imminent collapses. The /0804C02 frontage is classified as Partly Active, and some local movements of material were observed during the inspection.



Looking south towards sea stack at Ryhope Dene (Asset Ref. No. 121AB901B0804C02)



Access steps at Ryhope Village Dene in fair condition, although locally undercut.  
(Asset Ref. No. 121AB901B0804C02)

In the vicinity of a large rock stack along Pincushion Rocks, there have been further larger falls and slumps in the till section which connects the stack to the main cliff. There is evidence of water seepage and the precipitous overhang looks ready to fall. There are many further localised slumps in the cliffs all around the Pincushion Rocks headland.



Slumping and seepage near sea stack at Pincushion (Asset Ref. 121AB901B0804C02)



Recent slumping near sea stack at Pincushion (Asset Ref. No. 121AB901B0804C02)



Large slump at Pincushion, sand martin nests in upper cliff to left side of photo (Asset Ref. No. 121AB901B0804C02)



Southern boundary of frontage at Ryhope Dene (Asset Ref. No. 121AB901B0804C02)

The slumping continues along the southern section of Halliwell Banks all the way to Ryhope Dene. There have been several recent large slumps and there are many areas with extensive water seepage.

Slumps also are apparent either side of Ryhope Dene, and there is an extensive area of sand martin nests in the relatively freshly exposed sheer face to the immediate north of the dene.

#### **4. Comparison with Previous Assessment**

The previous formal walkover inspections across the whole study frontage were undertaken in July 2016.

Beach levels along the frontage north of the River Wear were mostly lower than or similar to 2016, exposing some defects at the toe of structures.

Refurbishment of Roker Pier, including repairs to handrailing and coping have been recently completed and the pier tunnel was recently opened for visits by the public.

Many structures were identified as being in fair, poor or very poor condition in 2016 and these findings remain valid in most locations where such grading was applied, although several structures in the Port of Sunderland have deteriorated significantly since the previous inspection.

#### **5. Problems Encountered and Uncertainty in Analysis**

All assets were inspected at suitable stages of the tide and therefore there were no major problems encountered. Occasional localised sea fog was encountered during inspections.

Access to inspect the assets around the Port of Sunderland was arranged with Sunderland City Council. All structures were inspected from the deck and it is recommended that a programme of vessel-based inspections (and if necessary underwater inspections) is undertaken by the Council to inform their ongoing maintenance and capital investment regimes in the port.

## 6. Conclusions and Recommended Actions

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

All condition assessment data and selected photographs have been uploaded to SANDS (Shoreline And Nearshore Database System). This includes all data and photographs from the previous inspections since 2002 that were originally held on an MS Access Databases that had become obsolete.

# Appendices

# **Appendix A**

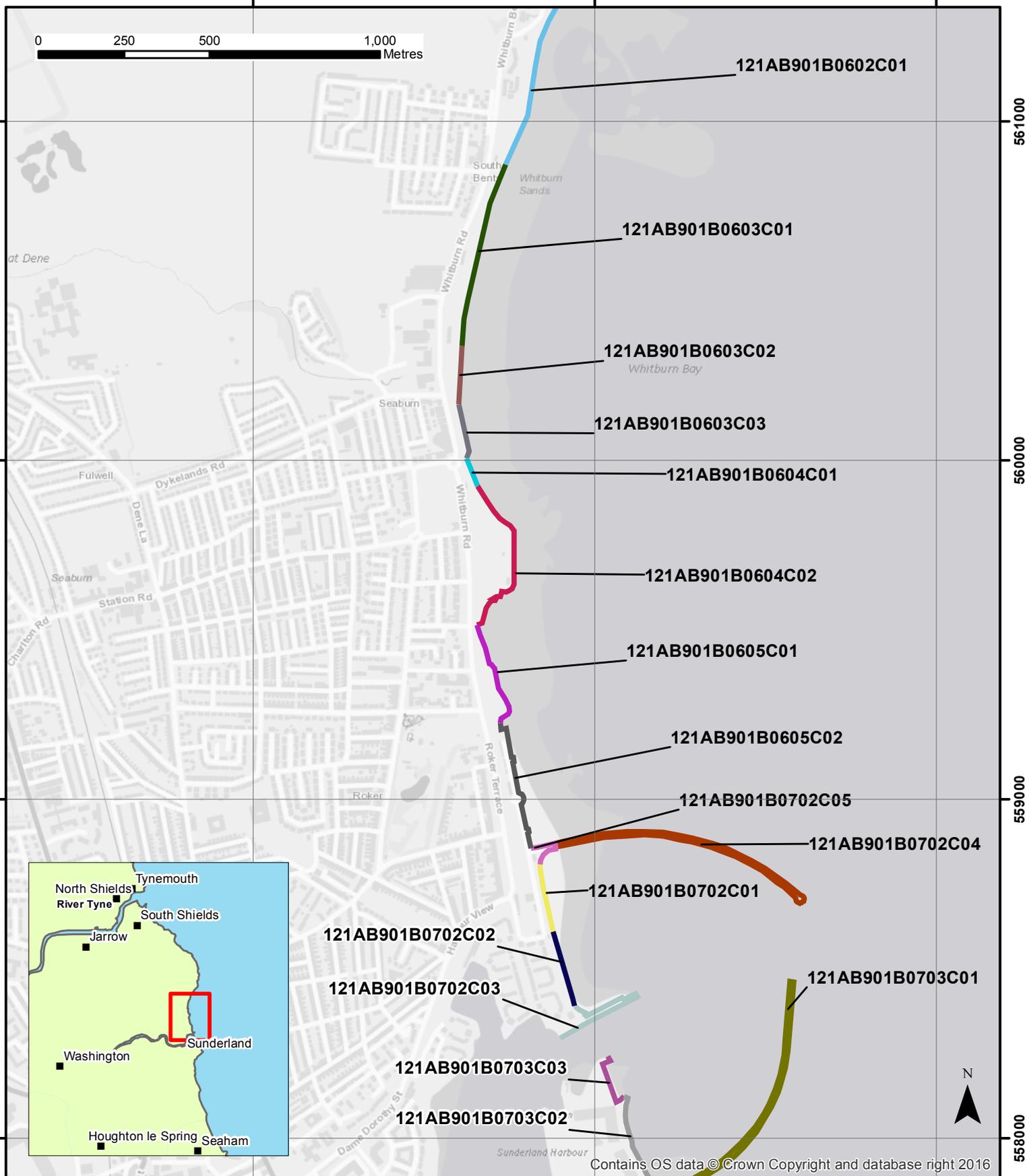
## **Asset Location Maps**

440000

441000

442000

0 250 500 1,000 Metres



Contains OS data © Crown Copyright and database right 2016

**Legend**

- Asset location
- NFCDD Asset Number

**Figure 1 - Map 1**

**Sunderland City Council Frontage**

Asset Inspection Report

Drawing Scale 1:15,000 at A4

Client:  
North East Coastal Group

Project:  
Cell 1 Regional Coastal Monitoring Programme

**WATER**  
Royal HaskoningDHV  
Marlborough House  
Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE

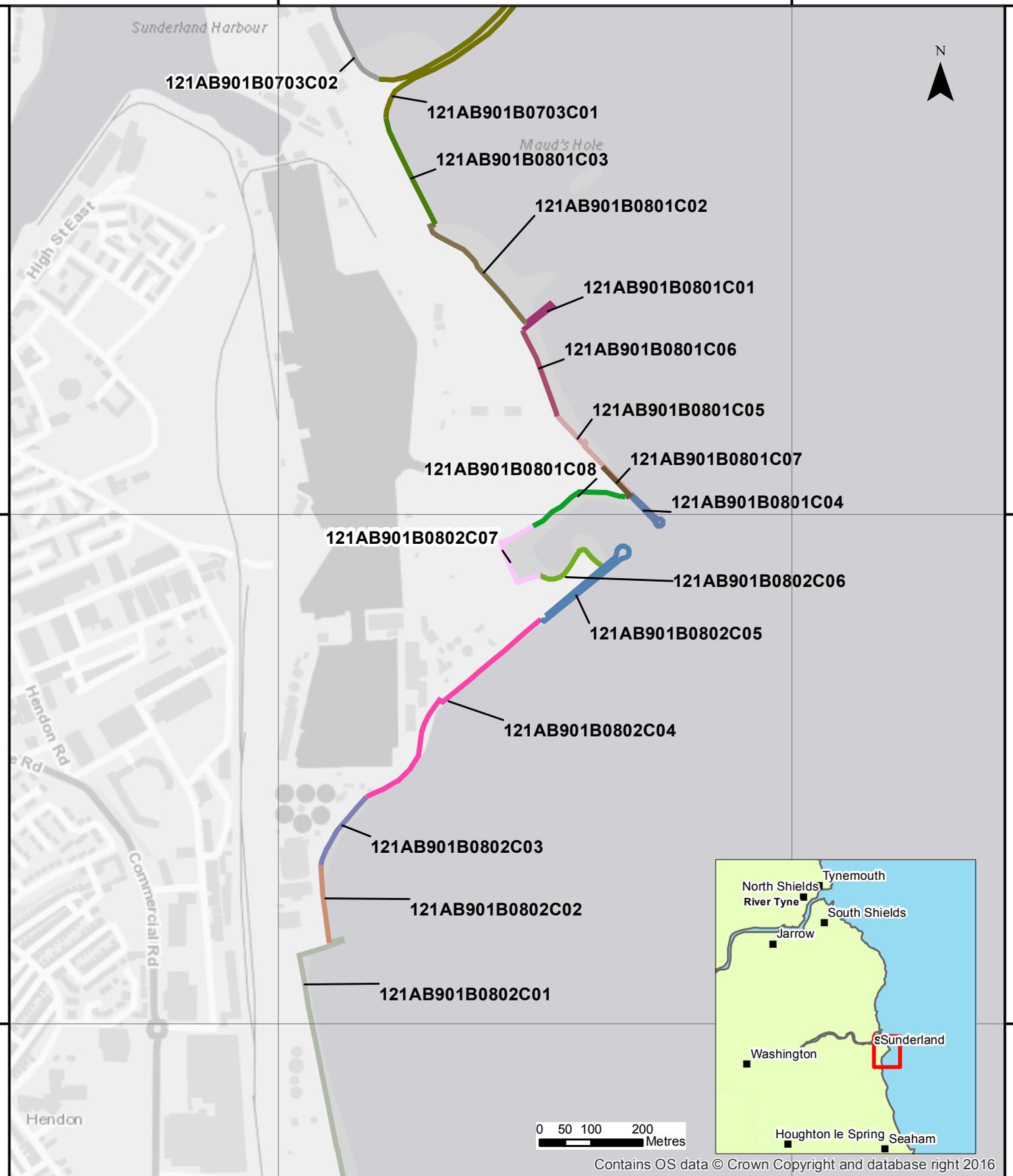
Tel: +44 (0)191 211 1300  
Fax: +44 (0)191 211 1313  
www.royalhaskoning.com



441000

442000

558000



557000

556000

Contains OS data © Crown Copyright and database right 2016

**Legend**

-  Asset location
-  NFCDD Asset Number

**Figure 1 - Map 2**

**Sunderland City Council Frontage**

Asset Inspection Report

Drawing Scale 1:15,000 at A4

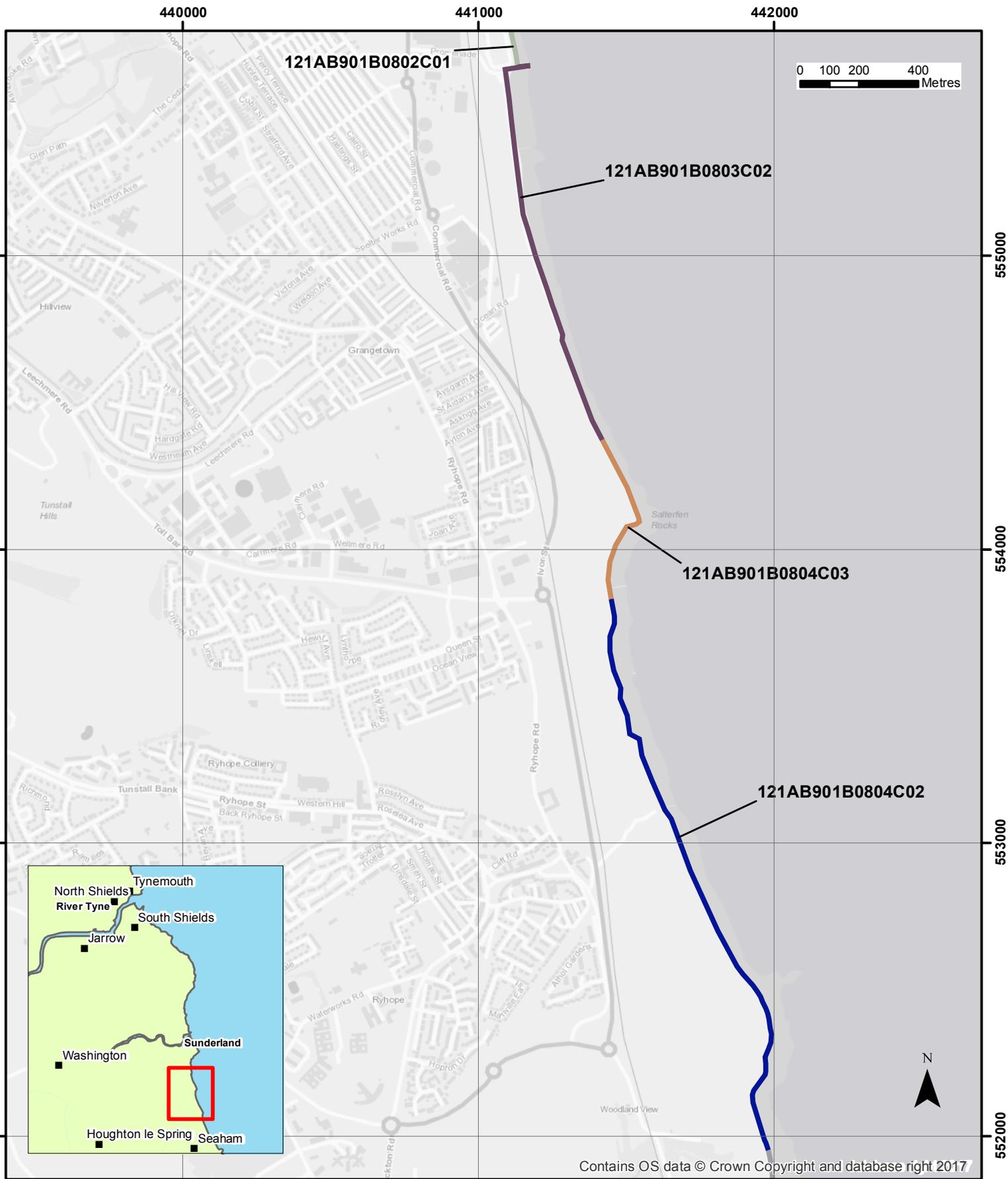
Client:  
North East Coastal Group

Project:  
Cell 1 Regional Coastal Monitoring Programme

**WATER**  
Royal HaskoningDHV  
Marlborough House  
Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE

Tel: +44 (0)191 211 1300  
Fax: +44 (0)191 211 1313  
www.royalhaskoning.com





**Legend**

-  Asset location
-  NFCDD Asset Number

**Figure 1 - Map 3**

**Sunderland City Council Frontage**

Asset Inspection Report

Drawing Scale 1:15,000 at A4

Client:  
North East Coastal Group

Project:  
Cell 1 Regional Coastal Monitoring Programme

**WATER**  
Royal HaskoningDHV  
Marlborough House  
Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE

Tel: +44 (0)191 211 1300  
Fax: +44 (0)191 211 1313  
[www.royalhaskoning.com](http://www.royalhaskoning.com)



# **Appendix B Asset Condition & Recommendations**

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2018	Overall Condition	Worst Condition	Residual Life (Years)	Recommendations	Urgency
121AB901B0602C01		Undefended frontage	Undefended frontage		609.3	15/08/2018	Similar to 2016: Beach backed by dunes in north which appear stable in front of coastal slope. Switches to eroding cliff at northern boundary.	2	2	>20	Continue to monitor	Routine
121AB901B0603C01	CPSE-220/6901/01	Concrete wall to promenade and to main coast road	Wall		551.6	15/08/2018	Walkway landward of sea wall replaced with new concrete finish surface along entire length. Concrete wall in north: cracking and spalling to promenade wall below coping along significant lengths, rear revetment has some damage e.g. at picnic area. Masonry wall in south: some damage to coping blocks in north, new coping blocks installed at south.	3	4	11-20	Repair cracks and spalling on face of concrete wall	Routine
121AB901B0603C02	CPSE-220/6902/01	690201 Masonry wall badly cracked over 30m section, possible settlement or undermining	Wall		172.4	15/08/2018	Cope stones recently replaced, and walkway landward of seawall replaced with exposed concrete exposed aggregate finish surface. Minor leakage through face of wall, occasional cracked blockwork. 1 No. riser of access steps damaged. Cracking and rust staining above outfall structure.	3	3	11-20	Repair cracking/damage, investigate leakage and locally repaint.	Routine
121AB901B0603C03	CPSE-220/6903/02	Masonry wall, recurve concrete coping and parapet wall	Wall		164	15/08/2018	Similar to 2016: Some open joints between masonry blocks. Cracks in bullnose in many places and cracking in crest wall. Corrosion on landward side from previous seat fixings. At access steps, handrail replaced and algal growth removed recently. Beach levels lower than 2016.	3	4	11-20	Infill cracks and replace reposit locally	Routine
121AB901B0604C01	CPSE-220/6904/01	Concrete encasement to old wall in good condition. Highly reflective wall effecting beach levels to North.	Wall		88.6	15/08/2018	Signs of localised chloride attack/staining in face of encasement wall. Coping stone damaged / broken off adjacent steps. Landward concrete retaining wall and prom surfacing in good condition.	3	3	>20	Repair local damage/spalling	Routine
121AB901B0604C02	CPSE-220/6905/03	Masonry wall with concrete coping. Concrete splash wall/grouted rubble revetment / natural slopes to rear.	Wall		528.1	15/08/2018	Seawall in fair condition. Heavy algal growth down face of wall at surface water outlets north of Parsons Rocks. Voids in stone/grout revetment above promenade recently infilled. Void remains under promenade at grouted section south of Parsons Rocks. Asphalt surface of promenade above seawall generally in fair condition with some uneven sections and surface cracks. Coping locally abraded/spalled although generally in fair condition. Remains of former access steps south of Parsons Rocks breaking up with blockwork debris on foreshore.	3	3	>20	Repair/repoint damaged coping. Investigate and repair void under promenade.	Routine
121AB901B0605C01	CPSE-220/6906/01	Concrete block wall above masonry wall cladding high cliff. Crest of wall 12.4mODN. Some blocks cracked	Wall		323.7	15/08/2018	High masonry wall above beach in fair condition. Some localised mortar loss in low masonry wall, and one block has been lost, localised abrasion damage in cope, occasional cracked blocks.	3	3	11-20	Replace missing block. Infill cracks and reposit	Routine
121AB901B0605C02	CPSE-220/6907/01	Concrete encasement of seawall. Masonry wall at southern extent.	Wall		418	15/08/2018	Seawall generally in good condition with some cracking and open joints. Damage to coping in masonry wall. Steps damaged opposite Smugglers Inn.	2	3	>20	Undertake localised repairs to cracks, joints and steps.	Routine
121AB901B0702C05	CPSE-220/6908/01	Masonry wall with concrete coping running into Roker Pier.	Wall		161.9	15/08/2018	Masonry walls at root of Roker Pier in good condition. Some localised mortar loss and abrasion of blockwork. Several sections of localised mortar loss on landward (pier) side.	2	3	>20	Localised repointing	Routine

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2018	Overall Condition	Worst Condition	Residual Life (Years)	Recommendations	Urgency
121AB901B0702C04	CPSE-220/6909/01	Roker Pier: Masonry and concrete structure protects harbour and retains beach to north.	Breakwater		1579	15/08/2018	Pier and lighthouse generally in good condition. Concrete deck surface completed in 2014. Handrailing recently replaced. Localised mortar loss below coping on north face above Roker Beach, occasional vertical cracking.	2	3	>20	Localised repointing and blockwork repairs. Monitor	Routine
121AB901B0702C01	CPSE-220/6910/02	Intermittent concrete splash wall.	Wall		201.8	15/08/2018	Similar to 2016: Wall generally in fair condition. Some spalling and abrasion of front face. Several horizontal cracks concrete in face of walls, with some spalling between cracks.	3	4	11-20	Repointing and infill spalled sections	Routine
121AB901B0702C02	CPSE-220/6911/03	New splash wall behind car park except over short section where wall is advanced. Rock armour revetment fronting concrete seawall.	Wall		228.4	15/08/2018	Similar to 2016: Rock revetment placed in front of splash wall. Coping and promenade surface in good condition, face of wall not visible behind rock armour. Rock revetment in good condition with even crest profile and good interlock.	2	2	>20	Monitor	Routine
121AB901B0702C03		Masonry and concrete pier structure. Access limited.	Breakwater		480.8	15/08/2018	Recent breach to Old North Pier infilled with rock armour and grout. Voids in north face infilled with grout. Void noted towards toe on northern side, missing blocks at seaward end and on southern side. At "Rats Corner" section upstream, localised damage to concrete coping, sheet piles not sufficiently visible for inspection.	4	4	11-20	Full inspection / survey of structure / confirm future strategy.	Routine
121AB901B0703C03	CPSE-220/6912/02	Armoured toe to grouted revetment	Armour	NZ41065810, NZ41035824	187.8	31/05/2018	Similar to 2016. Rock armour loosely placed with some towards toe and lacking interlock, slab shaped surface profile. Crest section of rock grouted with concrete has some localised damage to rocks and cracked grout. Several rocks detached from grout mattress at crest. Evidence of overtopping particularly at southern end, where rock armour appears depleted and there is settlement of grassland to rear of defence crest. Asset in fair condition overall.	4	4	1-5	Review overtopping performance of structure. Consider placement of additional rock armour and repair suspected overtopping damage.	Urgent
121AB901B0703C02	CPSE-220/6913/01	Masonry Quay wall. Development land to rear and crest wall above.	Wall	NZ41195785, NZ41085812	307.8	31/05/2018	Similar to 2016: wave overtopping has caused further erosion to high level berm at south end, seaward slope of berm eroded back to crest in localised areas. Coping of wall appears in fair condition. Additional missing blocks observed at northern (outer) end of structure. Overtopping has also broken up concrete apron on landward side of wall.	4	4	1-5	Reprofile embankment and place rock armour on seaward side to prevent further erosion of embankment. Alternatively crest wave return wall could be constructed. Repair missing blocks at northern end of wall. Minor repairs to concrete apron and coping stone.	Urgent
121AB901B0703C01	CPSE-220/6914/01	New South Pier, precast concrete and concrete bed footing founded to rock. Inspection and maintenance on a regular basis.	Breakwater	NZ41205777, NZ41575846	1625.7	31/05/2018	Structure has deteriorated since 2016: 2No. large sections of the lower deck missing concrete deck slabs and approx 50m length of coping blocks missing, potentially due to wave damage or broken out for repairing damage. Extensive damage to cope stones on landward side of upper wall.  2No. stays of navigation pole are broken, pole is leaning and appears at risk of collapse. Several large blocks remain missing at roundhead.  2No. open chambers (likely services pits) without covers or edge protection noted in deck and reported to Port authority as H&S hazard. Open chambers filled with water.  Upper deck of breakwater not inspected at seaward end due to fall from height risk. Damaged areas of upper deck appear to have been repaired although localised damage remains. No inspection of seaward face possible without boat.  It is understood emergency repair works to deck of pier are due to take place.	4	5	6-10	Provide covers for open chambers to prevent access and fall risk. Undertake full survey/underwater inspection. Replace missing blocks at seaward end and repair damage throughout structure. Remove or replace navigation pole.	Urgent

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2018	Overall Condition	Worst Condition	Residual Life (Years)	Recommendations	Urgency
121AB901B0801C03	CPSE-220/6915/01	Masonry wall undermined in poor condition. Docks behind.	Wall	NZ41305757, NZ41205777	229.4	31/05/2018	Structure severely deteriorated since 2016 inspection and no longer functioning as an effective sea defence.  Deck slab broken up into many sections and no longer functional. Concrete flood wall to rear of deck almost totally broken up.  Masonry facing of wall appears in similar condition to 2016: small area of rock remains at area where void identified in 2010 inspection. Approx 6 No. blocks are now missing from middle of wall and there appears to be open joints of approx 10m length section.  The northern end of the asset appears similar to 2016, with occasional sagging and uplift of deck slabs. Spalling and open joints adjacent cope stones.	5	5	0-5	Capital scheme needed to repair/replace structure.	Urgent
121AB901B0801C02	CPSE-220/6916/01	Rock and rubble armour in good condition.	Armour	NZ41485737, NZ41305757	282.6	31/05/2018	Similar to 2016. Rock armour in fair overall condition with even profiling and good interlock. Demolition waste and debris mixed in. Slightly uneven crest.	3	3	11-20	Continue to monitor	No Repairs
121AB901B0801C01	CPSE-220/6917/01	Concrete groyne in state of collapse.	Wall	NZ41475736, NZ41535740	141.5	31/05/2018	Similar to 2016. Structure remains in a collapsed state. Landwards section of asset integrated with rock armour. Remains will have limited effect on sediment transport and waves. One section of groyne appears at risk of toppling in short to medium term.	5	5	0	Confirm asset as redundant	No Repairs
121AB901B0801C06	CPSE-220/6917/02	Rubble revetment.	Revetment	NZ41545719, NZ41475736	181.9	31/05/2018	Similar to 2016: rock revetment in fair condition. Generally even profiling at southern end with relatively good interlock, some localised steeper sections. Sheet pile structure exposed towards southern end where there are gaps in rock armour.	3	4	>20	In-fill gaps in rock armour as required, continue to monitor.	Routine
121AB901B0801C05		Rubble revetment.	Revetment	NZ41685704, NZ41545719	217.5	31/05/2018	Similar to 2016. Stacked bund of rock armour at crest backing various concrete/masonry/sheet piles derelict structures with scattered blocks of concrete and armour stone and debris. Development of land to the rear is ongoing.	4	4	>20	Review defence requirements for any new developments.	Routine
121AB901B0801C07	CPSE-220/6925/01	Derelict breakwater made irregularly from masonry blocks, concrete, bagwork and rubble. Section and type varies greatly along length.	Breakwater	NZ41675703, NZ41635709	86	31/05/2018	Similar to 2016 poor to very poor condition. Extensive abrasion, cracking and spalling of concrete. Exposed reinforcement present throughout structure. Most northerly abutment on seaward face has become detached from pier and appears likely to topple. Landward side of pier backed by rubble armour which is in poor condition.	4	5	<5	Full survey. Significant repair works required, consider replacement or requirement for pier in wider strategy.	Urgent
121AB901B0801C04	CPSE-220/6918/02	Rock toe to old harbour wall.	Apron	NZ41685703, NZ41755698	184.5	31/05/2018	Derelict structure in similar condition to 2016 inspection. Heavily abraded deck and walls, exposing reinforcement. Roundhead failed. Extensive spalling and cracking of concrete on all sides of pier. End of pier appears more undercut than 2016 inspection, undercutting by approx 4m at toe of wall.	5	5	<10	Strategic review of South Outlet defence requirements	Urgent
121AB901B0801C08	CPSE-220/6926/01	Random rubble tipped into old dock to fill in front of buried quays.	Revetment	NZ41495697, NZ41675703	205.1	31/05/2018	Similar to 2016 inspection. Mainly demolition rubble in fair condition, no defined crest or profile. Some apparent erosion gullies present on crest, potentially due to surface water runoff from land behind. Some displacement of rubble due to wave overtopping of old North East Pier.	3	4	11-20	Strategic review of South Outlet defence requirements, consider constructing formal revetment	Routine
121AB901B0802C07	CPSE-220/6927/02	Random brick rubble tipped to slope above piling.	Revetment	NZ41465686, NZ41495697	199.3	31/05/2018	Similar to 2016. Sheet pile wall is heavily corroded (crumbles when touched). Rubble backing behind piled wall in fair condition. Rubble backfill in old dock basin seaward of piling with sandy foreshore between piles and rubble.	4	4	6-10	Consider within strategy for South Outlet defences	Routine
121AB901B0802C06	CPSE-220/6928/01	Partial rubble infilling of old dock. Slope variable	Revetment	NZ41515688, NZ41635689	166.6	31/05/2018	Similar to 2016. Rubble infill of former dock consisting mainly of demolition waste such as broken concrete slabs. In poor condition.	4	4	6-10	Consider within strategy for South Outlet defences. Consider topping up or constructing rock revetment.	Routine
121AB901B0802C05	CPSE-220/6929/03		Breakwater	NZ41515679, NZ41685692	449.2	31/05/2018	Similar to 2016. SW Breakwater in derelict condition. Many blocks missing and displaced from landward face. Unable to inspect seaward face of breakwater. Many large deck slabs are missing as in previous inspections. Large scale movement of foundations towards northern end of wall on landward side.	5	5	6-10	Strategic review consider realignment landward and/or replace with revetment.	Urgent

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2018	Overall Condition	Worst Condition	Residual Life (Years)	Recommendations	Urgency
121AB901B0802C04	CPSE-220/6919/03	Splash wall set back from main crest and with a crest of 8.0 mODN.	Splash Wall	NZ41175644, NZ41515679	511.2	31/05/2018	Similar to 2016. Spalling and corrosion marks in upper deck slabs and sea wall. Some coping stones along upper deck have been abraded. Section of lower deck slab missing towards northern end. Some sealant is missing between slabs in upper deck. Pile wall at toe appears corroded, some areas where sheet piles have become detached from concrete. Boat survey required for survey of sheet pile wall. Splash wall and upper deck are undercut at south end adjacent to asset 121AB901B0802C03.	3	4	11-20	Inspect piles from boat/diver. Replace sealant between slabs. Repairs to southern transition needed urgently.	Routine
121AB901B0802C03	CPSE-220/6920/04	Rubble placed to top of seawall.	Bank	NZ41085631, NZ41175644	163.4	31/05/2018	Similar to 2016. Northern end of seawall is collapsed and appears to have been filled in with rock rubble. Material has been lost from the crest since 2016 forming a low spot at the north which is eroding rubble ground to rear. Potential for the set back concrete flood wall to be undermined. Seawall is failing along majority of length with inadequate demolition rubble waste placed on crest. Rock armour toe fronting the retaining wall is in poor condition, lacking interlock with several displaced rocks. Seaward face of concrete boundary wall between STW and demolition rubble appears in good condition.	4	5	<5	Add rock armour to increase defence of failing seawall. Construct new concrete wall and crest.	Urgent
121AB901B0802C02	CPSE-220/6921/02	Splash wall with crest to 7.35mODN	Splash Wall	NZ41095615, NZ41085631	152.9	31/05/2018	Similar to 2016. Some rock armour is too small/placed too steeply so has been displaced causing damage to concrete wall. Uneven crest height of rock armour as rock displaced. Damage to crest and coping, particularly towards south, with crack and gaps between slabs, and some exposed reinforcement.	4	4	6-10	Top up rock armour and reprofile. Repair damage to coping and deck slabs.	Urgent
121AB901B0802C01	CPSE-220/6922/03		Splash Wall	NZ41135564, NZ41125616	616.9	31/05/2018	Deterioration since 2016: Missing section of coping at southern end. Many sections of crest wall are heavily spalled/rust stained. Construction works to locally replace rear splash wall underway during inspection. Surface water drain outfalls have degraded, surface water now discharges into fill material behind seawall, likely washout occurring. Sealant absent between some coping and deck slabs. Sheet pile wall at toe of sea wall is heavily corroded and abraded with holes. Several missing masonry blocks at toe of wall in northern corner. Several gaps in rock armour at northern corner.	4	4	6-10	Intrusive investigation to investigate cause of settled slabs combined with inspection of toe for undermining. Part of remediation of voiding and undermining could be undertaken by placing rock armour in front of sea wall. Replace sealant between deck slabs and coping. Repair surface water drainage outfalls to ensure adequate drainage from landward side of upper splash wall.	Urgent
121AB901B0803C02	CPSE-220/6923/08	Concrete sea wall with rock armour at toe	Sea Wall	NZ41285473, NZ41175565	1056.9	01/06/18	Seawall and rock armour similar to 2016. Concrete facing at some sections of wall heavily abraded exposing reinforcement. Some spalled concrete along length of promenade. Sheet pile wall is heavily corroded/abraded along toe of wall. Sections of failed railings along slipway and promenade due to corrosion/debris impact damage. Further deterioration of Port Boundary groyne nosing noted, another section has become visibly detached since 2016. Toe of northern slipway heavily abraded exposing reinforcement. Gap in defence height at Port Boundary groyne. Several concrete groynes are abraded at inner end exposing rebar. Access gaps in some groynes. Rock armour fronting sea wall is in fair condition. Concrete sewage outflow pipe in fair condition with sheet piles heavily corroded. South of the car park, pebbles / shingle have accumulated on promenade and on the rear slope behind secondary wall, likely due to overtopping.	3	4	11-20	Review historic drawings to determine importance of sheet piles, consider extending rock armour. Replace sealant between coping slabs. Repair defective concrete elements. Repair hand railing.	Routine

Asset NFCDD Reference Number	Alternative Asset Reference	Description of Asset (As recorded in NFCDD)	Asset Type (As recorded in NFCDD)	Asset Location description (As recorded in NFCDD)	Asset Length (m)	Inspection Date	Inspection Comments for 2018	Overall Condition	Worst Condition	Residual Life (Years)	Recommendations	Urgency
121AB901B0804C01	CPSE-220/6801/01	Eroding cliff to agricultural land.	Cliff - south of Ryhope Dene	NZ42335082, NZ41985195	1193.4	01/06/18	Active erosion along length upper cliff not vegetated. Ongoing erosion at Ryhope Nook footpath making steps unfit for safe access. Steps at Ryhope Dene appear in fair condition.	4	4	>20	Monitor slope failure with regards to cliff top footpath. Consider formalising steps at Ryhope Nook or abandon access.	No repairs
121AB901B0804C02		Undefended Frontage	Undefended Frontage	NZ41985195, NZ41445383	2040.3	01/06/18	Continuous slope failures in upper cliff and mud slides evident. Lower rock cliff eroding although some protection from cobble beach.	4	4	>20	Monitor slope failure with regards to cliff top footpath.	Routine
121AB901B0804C03	CPSE-220/6924/01	Eroding cliff over full length but only 0.6Km reported to be in need of work.	Undefended Frontage	NZ41445383, NZ41415437	614.9	01/06/18	Small-scale but regular ongoing slumping in soft material that overlays the solid geology base. Occasional caves and arches formed at the base of the cliffs. Many recent mudslides / slips of upper cliff onto beach.	4	4	>20	Monitor slope failure with regards to cliff top footpath.	Routine

	= condition worse than 2016
	= condition improved since 2016