



**Cell 1 Regional Coastal Monitoring Programme
Coastal Walkover Inspections 2010**



**Durham County Council
Final Report**

September 2010

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Appendix A Asset Locations

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Abbreviations and Acronyms

Acronym / Abbreviation	Definition
CAM	Condition Assessment Manual
NFCDD	National Flood and Coastal Defence Database

Asset Condition Grades

Grade	Condition Description
1	Very Good
2	Good
3	Fair
4	Poor
5	Very Poor

Glossary of Terms

Term	Definition
Beach nourishment	Artificial process of replenishing a beach with material from another source.
Berm crest	Ridge of sand or gravel deposited by wave action on the shore just above the normal high water mark.
Breaker zone	Area in the sea where the waves break.
Coastal squeeze	The reduction in habitat area which can arise if the natural landward migration of a habitat under sea level rise is prevented by the fixing of the high water mark, e.g. a sea wall.
Downdrift	Direction of alongshore movement of beach materials.
Ebb-tide	The falling tide, part of the tidal cycle between high water and the next low water.
Fetch	Length of water over which a given wind has blown that determines the size of the waves produced.
Flood-tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone between the high water and low water marks, also known as the inter-tidal zone.
Geomorphology	The branch of physical geography/geology which deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc.
Groyne	Shore protection structure built perpendicular to the shore; designed to trap sediment.
Mean High Water (MHW)	The average of all high waters observed over a sufficiently long period.
Mean Low Water (MLW)	The average of all low waters observed over a sufficiently long period.
Mean Sea Level (MSL)	Average height of the sea surface over a 19-year period.
Offshore zone	Extends from the low water mark to a water depth of about 15 m and is permanently covered with water.
Storm surge	A rise in the sea surface on an open coast, resulting from a storm.
Swell	Waves that have travelled out of the area in which they were generated.
Tidal prism	The volume of water within the estuary between the level of high and low tide, typically taken for mean spring tides.
Tide	Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Topography	Configuration of a surface including its relief and the position of its natural and man-made features.
Transgression	The landward movement of the shoreline in response to a rise in relative sea level.
Updrift	Direction opposite to the predominant movement of longshore transport.
Wave direction	Direction from which a wave approaches.
Wave refraction	Process by which the direction of approach of a wave changes as it moves into shallow water.

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 till to varying thicknesses, softer rock cliffs, and extensive landslide complexes.

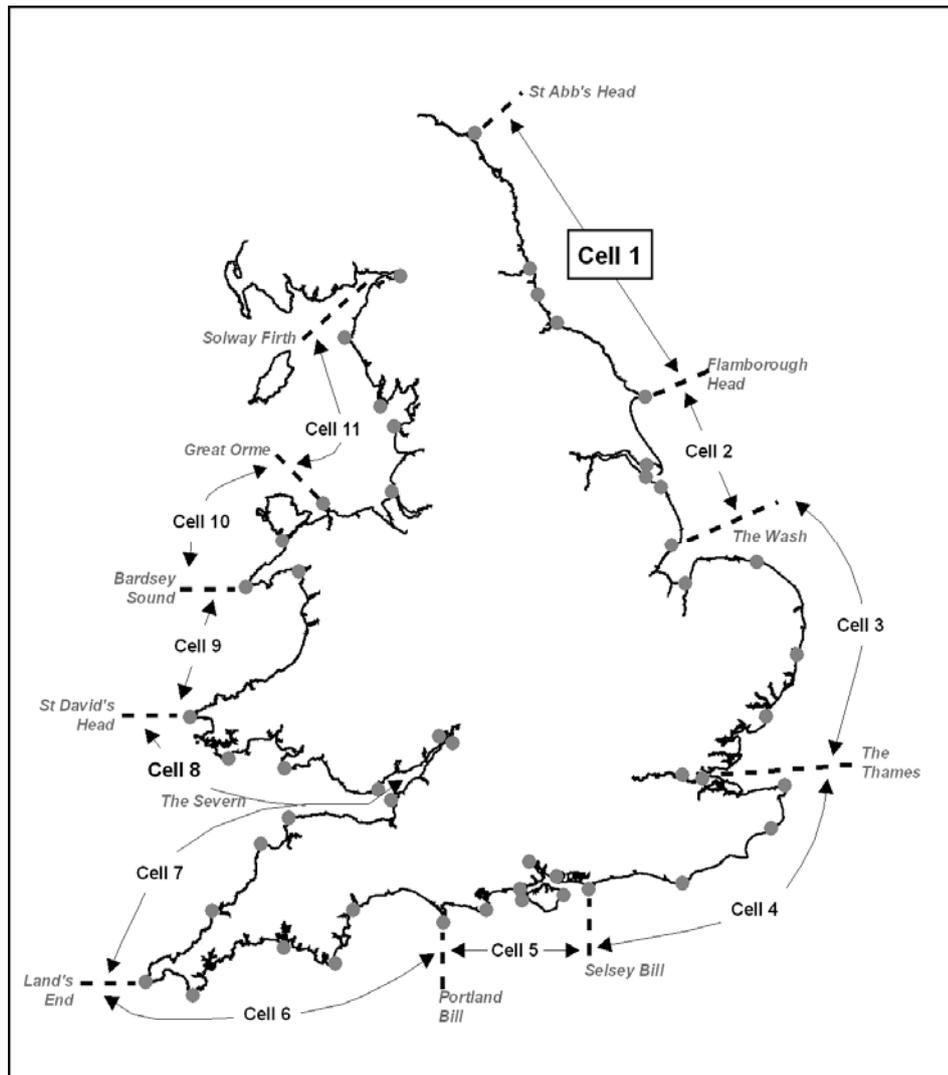


Figure 1 - Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008 and is managed by Scarborough Borough Council on behalf of the North East Coastal Group. It is funded by the Environment Agency, working in partnership with the following organisations.



The data collection, analysis and reporting is being undertaken as a partnership between 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
- walk-over surveys

The present report is **Coastal Walkover Inspections 2010** and provides a summary of the main findings from the walkover inspections of Durham County 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

Durham County Council's frontage extends from Ryhope Dene in the north to Crimdon Beck in the south.

1.2 Methodology

The walkover inspections for the Durham County Council frontage were undertaken on the 28th July and 21st September 2010. The weather experienced during the inspections was generally fine, with no visibility problems.

The frontage has been split into a number of 'asset lengths' (Appendix A), the location and numbering of which correlates with those defined in the National Flood and Coastal Defence Database (NFCDD) which is maintained by the Environment Agency. All maritime Local Authorities that act as Coast Protection Authorities have a duty to report findings from walkover inspections into the NFCDD.

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 in accordance with the Environment Agency's Condition Assessment Manual (CAM), with estimates made of their residual life and assessments made of the urgency of any necessary repair work.

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.

In addition to this report, all detailed inspection reports and a selection of appropriate photographs have been entered into the NFCDD.

2. Overview

There have been changes in the condition of some of the natural defence assets along the Durham County frontage since the previous formal inspections in November 2008. The condition of the built defences generally remains as reported in 2008.

The winter of 2009/2010 was particularly harsh, with sub-zero temperatures for considerable durations and heavy snowfall and rainfall. Cycles of freeze-thaw within the rock cliffs would have weakened their structure in places, causing existing fissures to widen and perhaps creating new fissures. The thick layers of snow lying on the cliff top would then have placed increased loading on the surface and with marine action attacking the toe, especially during winter storms and high tides, failures were triggered in several locations.

In addition, the high tides during the spring equinox of March 2010 coincided with storm conditions, leading to additional pressure on some frontages.

As a result of these weather and marine conditions, the following significant findings were observed during the 2010 inspections:

- There have been ongoing rock falls in the harder rock geology (including cracking, formation of caves and arches, and overhangs) and occasional slumps in the overlying till along undefended sections of cliff. Particularly active sections are around Shot Rock and Loom, where a large cliff top collapse has resulted in inland diversion of the cliff top footpath.
- Foreshore levels along the Seaham frontage were generally quite high, with cobbles at the southern end almost reaching the crest of the sea wall and in places blocking the water-return drainage holes in the crest. At the southern end, high beach levels continue to provide a 'ramping' effect, leading to waves overtopping the wall, crashing against the backing cliffs and causing erosion.
- There has been a slippage along a short section of the blockwork revetment that protects the coastal slope behind the Seaham promenade. This would benefit from maintenance to prevent further unravelling.
- There remains ongoing slumping of the undefended cliffs to the north of Seaham North Pier (in front of the car park).
- Seaham Harbour is undergoing redevelopment, with the construction of a new floating pontoon, lock gates and dock-side facilities.
- Colliery spoil on the foreshore north of Nose's Point is continuing to erode through cliffing at its seaward edge. There are occasional slumps in the backing cliffs in areas where the spoil beach is narrowest.
- Despite some minor erosion of the spoil in Blast Beach, there remains a sufficient width of beach to protect the generally stable backing cliffs.
- Generally, where notable widths of colliery spoil is present on the foreshore, such as at Blast Beach, Hawthorne Hive, Shippersea Bay, north of Fox Hole Dene and at Horden Denes, the backing cliffs are stable. Where spoil is absent, the cliffs are actively eroding.

- A local slope failure has occurred within Crimdon Park Caravan Site and a temporary barrier has been erected from steel tubing and plastic fencing with warning signs erected to warn members of the public.

3. Condition Assessment

3.1 Seaham

The northern section of Durham County Council's jurisdiction extends along undefended sea cliffs from Ryhope Dene to the picnic site located to the north of Seaham Dene. The cliffs comprise a Magnesian Limestone base with overlying glacial till (below left). There remains ongoing active slumping in the till along the whole undefended length, but of a local nature. There are frequent caves and arches formed in the harder rock at the base of the cliffs caused by differential erosion by waves (below right).



Immediately adjacent to the access steps from the picnic site car park is a stream that discharges to the foreshore. In 2008 this stream was in spate due to the heavy rainfall that preceded the survey (below left). During the 2010 inspections, there was very little flow (below right). The short length of blockwork wall immediately to the north of the stream, however, was suffering outflanking where it ties-in to the undefended cliffs.



Immediately south of the car park access steps is a short undefended length of cliff, followed by a short (approximately 10m) length of low-level wall which is moderately abraded and slightly outflanked at its northern end (below left). This situation has not worsened since the 2008 inspections and during the recent visit the beach levels at the wall were quite high, offering protection to the structure (below right). Backing the southern end of this low-level wall, and continuing behind the very northern end of the Seaham sea wall is a blockwork revetment on the backing slope which remains in fair condition.



The visible sections of the main Seaham sea wall and promenade are in fair condition (below left), with most construction joints adequately sealed, but some minor gaps starting to become apparent at occasional joints. There are cracks at the joints between all three sets of access steps and their intersections with the main wall (below right), but there is relatively little abrasion damage and no obvious signs of cracking or settlement along the main wall itself.



Along part of the frontage there is a blockwork revetment protecting part of the coastal slope behind the sea wall and promenade. This appears to have suffered some slippage since the last inspection and could usefully be maintained to improve stability of the surrounding slope (below left). There are also the remnants of three timber groynes (one shown below right) and two concrete outfalls, all supported on corroded steel piles. Due to the high beach levels little of these structures could be visually inspected.



The beach levels at the time of the inspection were high, with a cobble berm overlaying the sandy foreshore and covering parts of the face of the wall to varying levels along the frontage (below left). This meant that the lower sections and toe of the sea wall could not visually be inspected. At the southern end of the frontage, towards Featherbed Rocks, the beach levels were highest and in one place shingle and cobble is blocking the drainage holes in the crest wall (below right).



The effect of the high beach levels has been to protect the sea wall from direct wave action, but also to create a 'ramp' up which waves can run and overtop the sea wall, causing local erosion of the backing slopes. This process appears to have occurred recently directly behind the areas with highest foreshore levels due to the presence of cliff debris at the wall at the rear of the promenade (below left). Incidences of local abrasion damage, occasional cracking and missing gap sealant (below right) in the sea wall increase with progression towards its southern end.



Around Featherbed Rocks, a rock revetment has been constructed extending around the headland and further south (below left). Where this structure stands proud of the toe of the cliff, some rockfalls and slumps in the softer material remain ongoing (slumps shown below right). In places this is releasing rubble down the cliff face.



South of the headland, the rock armour protects a concrete platform (below left) and cliff top properties. There is slight outflanking at the tie-in between the platform and the cliffs which should continue to be monitored for signs of worsening. The rock revetment then starts to taper out with progression south (below right).



Along the lightly defended or undefended cliffs south of the formal revetment, there is evidence of ongoing slumping in the cliffs (below left), revealing soil netting in places near the access steps (below right).



Due to this ongoing process, direct access to the cliff top from the car park has been prevented using robust fencing (below left). Access to the foreshore is made via a ramp which is protected by a vertical wall showing some cracking. Below the wall, the cliffs have experienced some slumping (below right) which should be monitored into the future.



The cliffs in the small bay south of the access steps are well protected by high beach levels and are currently stable (below left). The landward end of North Pier, at Red Acre Point, has been reinforced with rock armour and although there appears to be some erosion to the landward end of this (below right), it is not worse than was recorded in 2008.



3.2 Seaham Harbour

Seaham Harbour is privately-owned by the Seaham Harbour Dock Company, with most areas not being publicly-accessible. During the 2010 inspections, construction work was ongoing as part of the Council-supported £3M North Dock Regeneration Project, which will include a new floating pontoon, lock gates and dock-side facilities (below).



Along South Dock, considerable dock-related activity was ongoing (below left) so the structures at the root of the South Pier were only inspected from a distance. Rubble has been tipped along the seaward face of South Pier in one area fronting South Dock, with rock revetment then continuing to provide a more formal defence further south (below left).



Vessel-based inspections of Seaham Harbour by the Dock Company at appropriate intervals following construction of the regeneration project are recommended.

3.3 Dawdon

The frontage between Seaham Harbour South Pier and Seaham Fleet Rock is protected by a continuation of the rock armour revetment extending southwards from the South Pier (below left). This has stabilised the previously eroding cliffs. South of the revetment to Nose's Point, the cliffs are fronted by a colliery spoil slope which is actively cliffing at its seaward edge with occasional slumps in the upper spoil slope face (below right).



3.4 Nose's Point

At Nose's Point headland, the cliffs characteristically have caves and arches formed at their base (below left), with rocky outcrops on the foreshore (below right). The headland appears relatively stable and exerts a control on both the Dawdon frontage to its north and Blast Beach to the south.



3.5 Blast Beach

Between Nose's Point and Chourdon Point, the (now relict) cliffline is protected by a relatively wide colliery spoil beach (below left). In places there is cracking in the spoil clifflet (below right), indicating that clumps will continue to fail.



In general, the backing cliffs are stable and well vegetated, but there are areas of occasional slumps (below left) and cracks (below right).



3.6 Chourdon Point

At Chourdon Point there is more evidence of fracturing in the harder rock structure, leading to caves at the base. There is more frequent slumping in the overlying till. There is a particularly vulnerable section at the 'point' of the headland, where rockfalls have left overhangs (below left) and a large cave has excavated through the rock structure to link up with an arch feature (below right). It is highly likely that the roof of this arch will collapse, leaving pillars standing.



3.7 Hawthorne Hive

The colliery spoil beach at the base of the cliffs in Hawthorne Hive is in places cliffing, showing signs of ongoing erosion. The waste beach becomes wider and higher in the centre of the bay, where the backing cliffs become much more stable as a consequence (below left). The cliffs at Hive Point become a little more fractured in structure with caves forming at the base (below right) and south to Beacon Point there is yet more activity, with local rockfalls and large rock stacks and smaller pillars on the foreshore. There are some areas where slumps of the softer material have occurred and one wide but shallow cave has formed at the base of the cliffs just north of Beacon Point.



3.8 Shippersea Bay to Horden Point

The colliery spoil beach at Shippersea Bay again provides protection to the backing cliffs (below left). There is a clear distinction (below right) at the northern end of the bay, just south of Beacon Point, between where colliery spoil protects the cliff and where the cliffs are unprotected.



Around Shippersea Point the cliffs are subject to cave and arch formation at their base, with local rockfalls occasionally occurring (below left). The cliffs around Shot Rock and Loom are particularly active with rockfalls and there has been one large collapse from the upper cliff section (below right), resulting in fencing being erected near this susceptible cliff edge to locally divert walkers away from the cliff-top footpath.



Between Loom and Fox Holes colliery waste again provides a protective beach (below left) but south from the outfall at Fox Hole Dene to Horden Point, the cliffs again are eroding through occasional slumps (below right).



3.9 Horden Denes

Between Horden Point and Blackhall Rocks there is the greatest uninterrupted length of colliery spoil beach (below left). This protects the backing cliffs from marine action, enabling them to become stable and vegetated (below right).



Several lagoons are also formed at the rear of the spoil beach, where levels are sufficiently high to prevent regular marine action (below left). There is one location where some outfall pipes are present on the lower foreshore, one of which is still discharging (below right), as well as some debris from a concrete structure.



The foreshore at Horden is, in many places, boulder-strewn.

However, despite the protection afforded by the foreshore and spoil beach, there remains occasional local slumping in the backing slopes.



3.10 Blackhall Rocks and Crimdon Park Caravan Site

At Blackhall Rocks there is an extensive rocky outcrop on the foreshore (below left), and the backing cliffs around Gin Cave have cave formation at their base (below right).



Gin Cave is an extensive cave with multiple openings (below left). The cave roof and walls appear relatively stable although there is evidence of historic failure as a large piece of rock has fallen from the roof above the northern entrance and now stands on the foreshore (below right).



The frontage south of Blackhall Rocks is protected by the rock scars of the foreshore. The cliffs are formed from softer material overlying a near vertical hard rock base (below left). The softer material is slumping throughout although the extensive vegetation coverage indicates a relatively slow rate of erosion. Where material has fallen onto the foreshore, vegetation is present, suggesting a relatively stable environment. Rock falls from oversteepened/overhanging sections are evident locally as material is present on the foreshore (below right). Fractures are visible in the rock indicating potential failure locations in the future.



Timber access steps lead to a concrete access ramp to the south of Limekiln Gill (below left). The ramp is supported on rock filled gabion baskets which are generally in good condition. Erosion at the bottom of the ramp has led to the loss of a section of concrete, resulting in a local reduction in support to the slab (below right). At present there is no significant movement or distress to the structure although the situation should continue to be monitored.



A local slope failure has occurred within Crimdon Park Caravan Site. Approximately 100m north of the Crimdon Park access steps, the timber fencing has been lost over a length of approximately 10m. A temporary barrier has been erected from steel tubing and plastic fencing with warning signs erected to warn members of the public (below).



3.11 Crimdon Park Caravan Site to Crimdon Beck

Between the southern extent of Crimdon Park Caravan Site and Crimdon Beck, the frontage comprises of extensive dunes (below left). This length of frontage is not sheltered by protective scars, however a wide sandy beach is present.

The crest level of the dunes is highest in the north, with a well vegetated slope at a relatively shallow angle. Further south, the crest level falls and the dunes widen into a dune field. The seaward dunes have experienced minor slumping locally, particularly to the south on the seaward dunes which are generally steeper and have more sporadic vegetation cover.

Chesnut fencing (below right) is in place to aid with sand accretion and control pedestrian access around the access steps from the car park, where minor erosion is evident.



A network of informal footpaths crosses the dunes in addition to the more formal boardwalks and aggregate footpaths. This has led to loss of vegetation and minor lowering of the dunes in proximity to these routes.



On the day of inspection, the mouth/outfall of Crimdon Beck was dry.

There was no evidence of excessive erosion/lowering of beach levels caused by the channel.

4. Comparison with Previous Assessment

The previous formal assessment across the whole study frontage was undertaken in November 2008. Since that time it is notable that several areas of undefended cliff have suffered from further fracturing of the rock structure. In some cases this has led to local rock falls, sometimes accompanied by small slumps in the overlying till. In one location near Loom, it has resulted in the collapse of a section of several tens of metres of cliff top, necessitating the diversion inland of the public footpath.

5. Problems Encountered and Uncertainty in Analysis

All assets were inspected at suitable stages of the tide and therefore there were no problems encountered.

6. Conclusions and Recommended Actions

The ongoing erosion of undefended sea cliffs does not, at present, cause any significant increase in risk to people, property or infrastructure. However, it is highly recommended that continued monitoring is undertaken for all assets.

Specific recommendations for individual assets given in the table below:

Defence	Location	Description	Priority	Recommended Action Date	Recommended Action	Details
121AC901C0102C01	Hall Farm to Seaham	Seawall	routine	2012	improve condition through maintenance	Routine maintenance to fill gaps at joints.
121AC901C0103C01	Featherbed Rocks	Rock Revetment	no repairs	2012	continue active monitoring	Focus attention on outflanking between concrete platform and cliffs.
121AC901C0103C06	Red Acre, Seaham	Cliff	no repairs	2012	continue active monitoring	Public safety needs monitoring - access to cliff top controlled by fencing.
121AC901C0103C05	Red Acre Point, Seaham	Cliff	no repairs	2012	continue active monitoring	
121AC901C0103C07	Red Acre Point, Seaham	Wall	routine	2012	improve condition through maintenance	Minor repairs to cracks. Monitor cliff slump below wall.
121AC901C0104C02	Red Acre Point, Seaham	Armour	no repairs	2012	continue active monitoring	Check for outflanking at root.
121AC901C0104C03	Seaham Harbour	Wall		2012	Not inspected due to no access restrictions during construction and port activities.	Detailed inspection by Seaham Harbour Dock company.
121AC901C0104C04		Apron		2012		
121AC901C0104C05		Revetment		2012		
121AC901C0104C06		Breakwater		2012		
121AC901C0104C07		Breakwater		2012		
121AC901C0104C08		Breakwater		2012		
121AC901C0104C09		Breakwater		2012		
121AC901C0104C10		Wall		2012		
121AC901C0104C11		Wall		2012		
121AC901C0104C12		Wall		2012		
121AC901C0104C13		Breakwater		2012		
121AC901C0104C14		Wall		2012		
121AC901C0104C15		Wall		2012		
121AC901C0104C17		Breakwater		2012		
121AC901C0104C16	Seaham	Wall	no repairs	2012	notify third party and seek action	Detailed inspection by Seaham Harbour Dock company.
121AC901C0104C01	Seaham	Wall	no repairs	2012	continue active monitoring	
121AC901C0105C01	Dawdon	Cliff/Scarp	no repairs	2012	continue active monitoring	
121AC901C0106C01	near Seahm Fleet Rock	Recharge	routine	2012	improve condition through maintenance	Clear-up of debris (e.g. pipework) eroded from spoil.
121AC901C0107C01	north of Chourdon Point	Recharge	no repairs	2012	continue active monitoring	Beach profiles to monitor cut-back of spoil. Monitor rate of erosion of colliery spoil.

Defence	Location	Description	Priority	Recommended Action Date	Recommended Action	Details
121AC901C0107C02	Chourdon Point	Cliff	no repairs	2012	continue active monitoring	Monitor deterioration of cave/arch.
121AC901C0201C01	Chourdon Point to Horden Point	Cliff/Scarp	routine	2012	improve condition through maintenance	Repair broken outfall pipe.
121AC901C0201C02	Horden Point to Blackhalls Rock	Recharge	no repairs	2012	continue active monitoring	
121AC901C0301C01	Blackhalls Rocks to Crimdon Caravan Park	Cliff/Scarp	no repairs	2012	continue active monitoring	Monitor cliff top slumping through Caravan Park.
121AC901C0301C02	Crimdon Caravan Park to Crimdon Dene	Dunes	no repairs	2012	continue active monitoring	

Appendices

Appendix A

Asset Locations

442000

443000

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552000

551000

550000

549000

0 100 200 400 Metres

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121AC901C0102C01

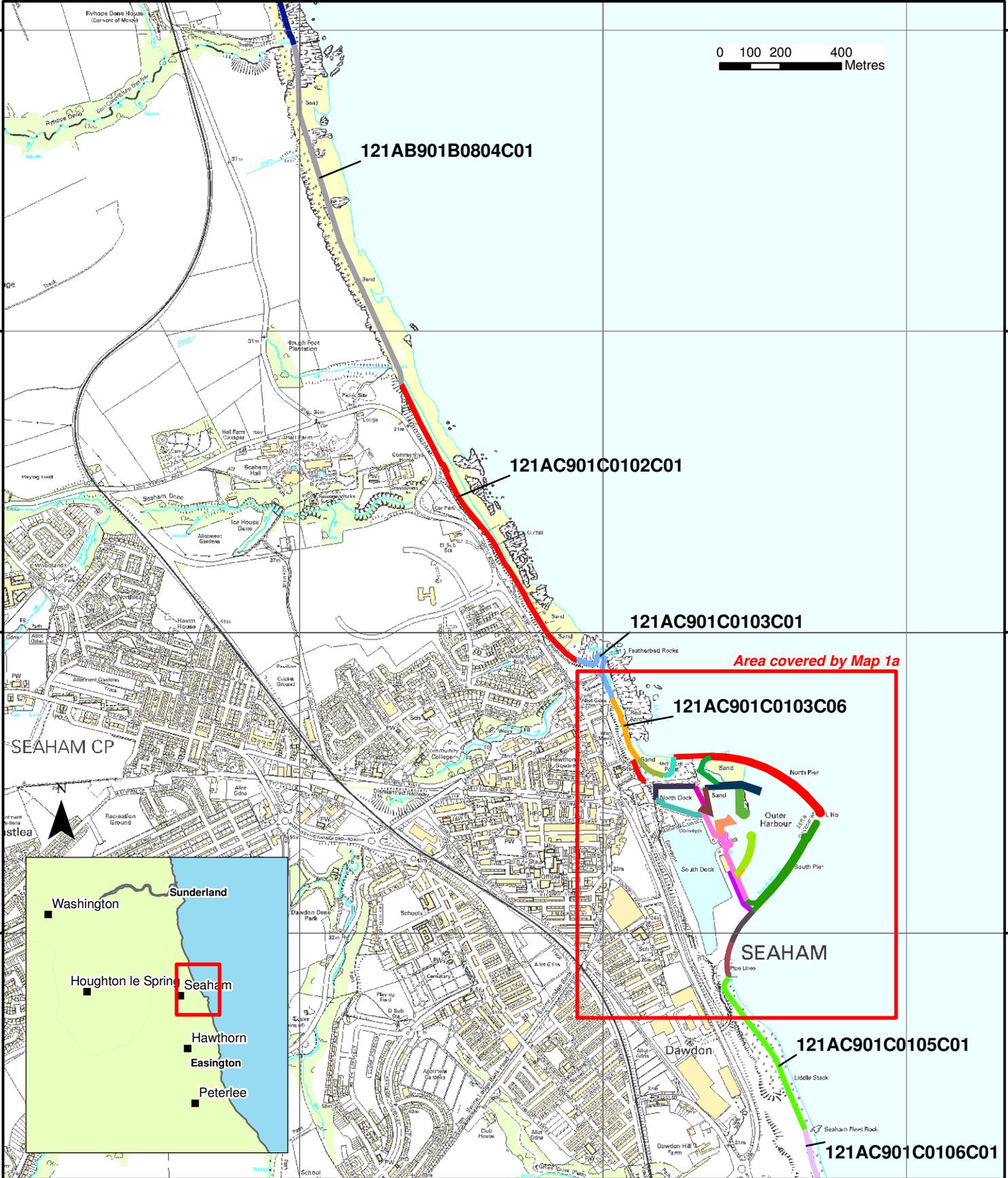
121AC901C0103C01

Area covered by Map 1a

121AC901C0103C06

121AC901C0105C01

121AC901C0106C01



Legend

Asset location
NFCDD Asset Number

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

**Figure 1 - Map 1
Durham County
Council Frontage**

Asset Inspection
Report 2010

Drawing Scale 1:15,000 at A4



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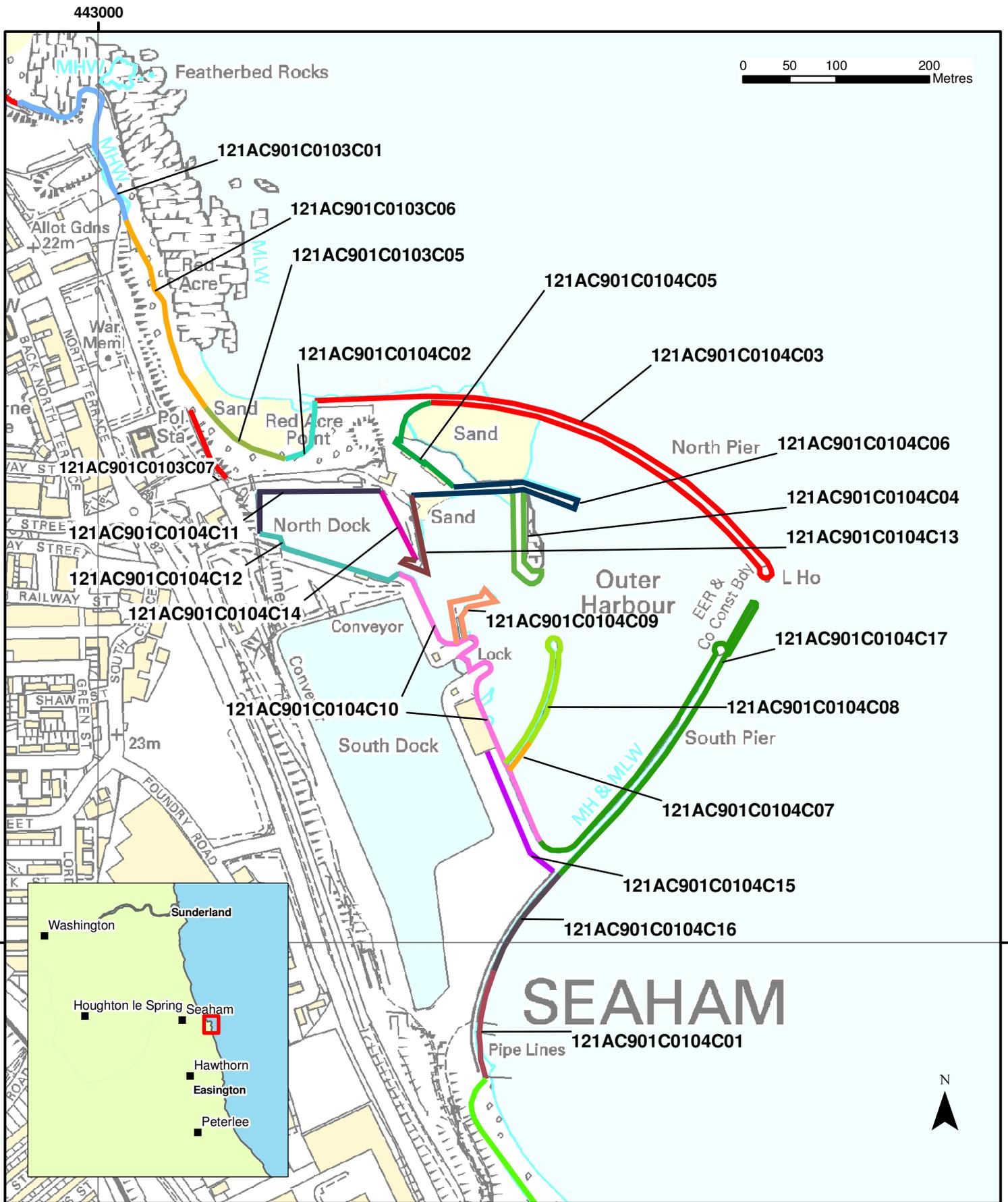
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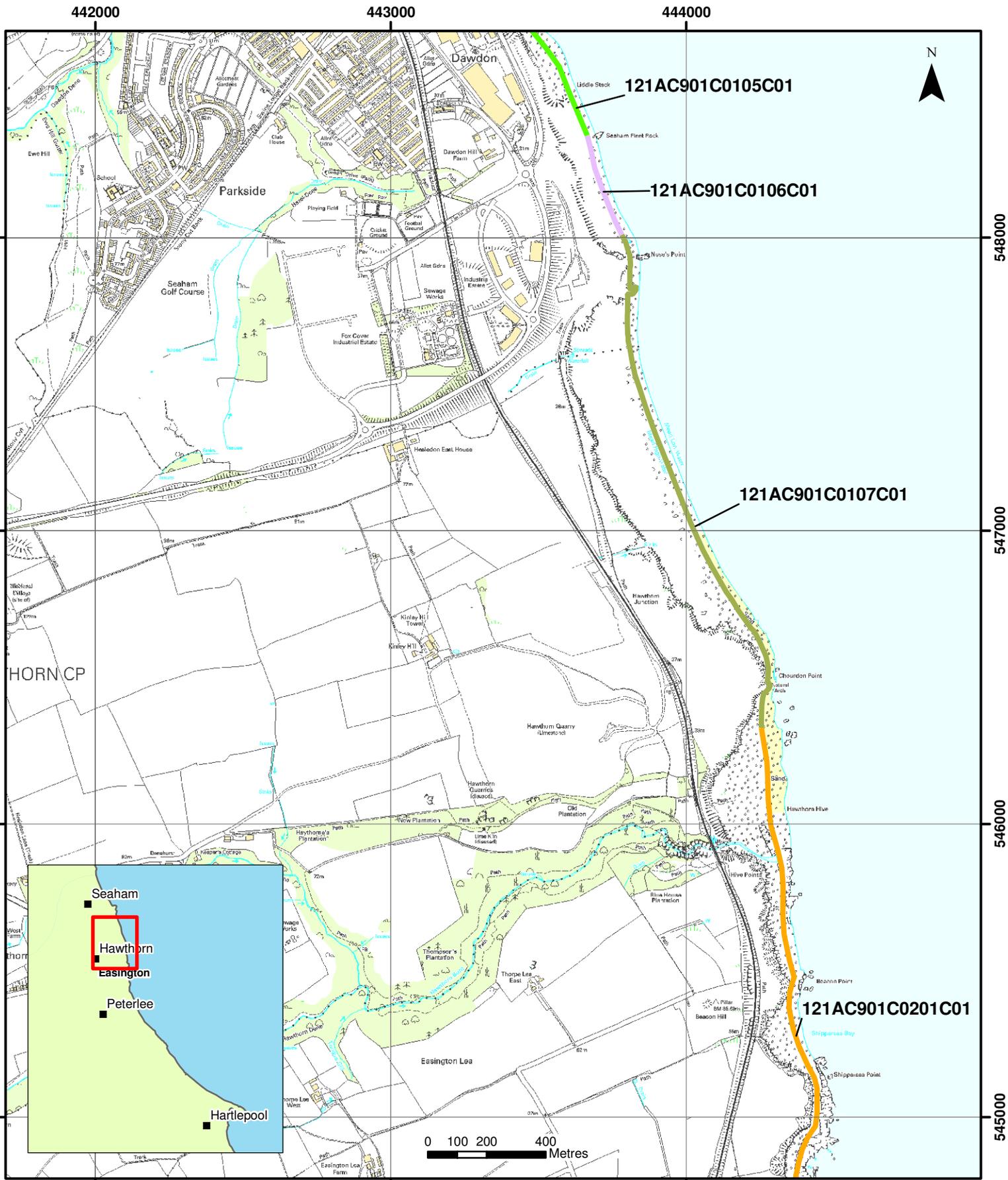


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Checked by: MD Date: 28/05/2010
Approved by: NC Date: 28/05/2010





Legend

-  Asset location
-  NFCDD Asset Number

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

**Figure 1 - Map 2
 Durham County
 Council Frontage**

Asset Inspection
 Report 2010

Drawing Scale 1:15,000 at A4



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444000

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0 100 200 400 Metres



Legend

 Asset location
 NFCDD Asset Number

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

**Figure 1 - Map 3
 Durham County
 Council Frontage**

Asset Inspection
 Report 2010

Drawing Scale 1:15,000 at A4



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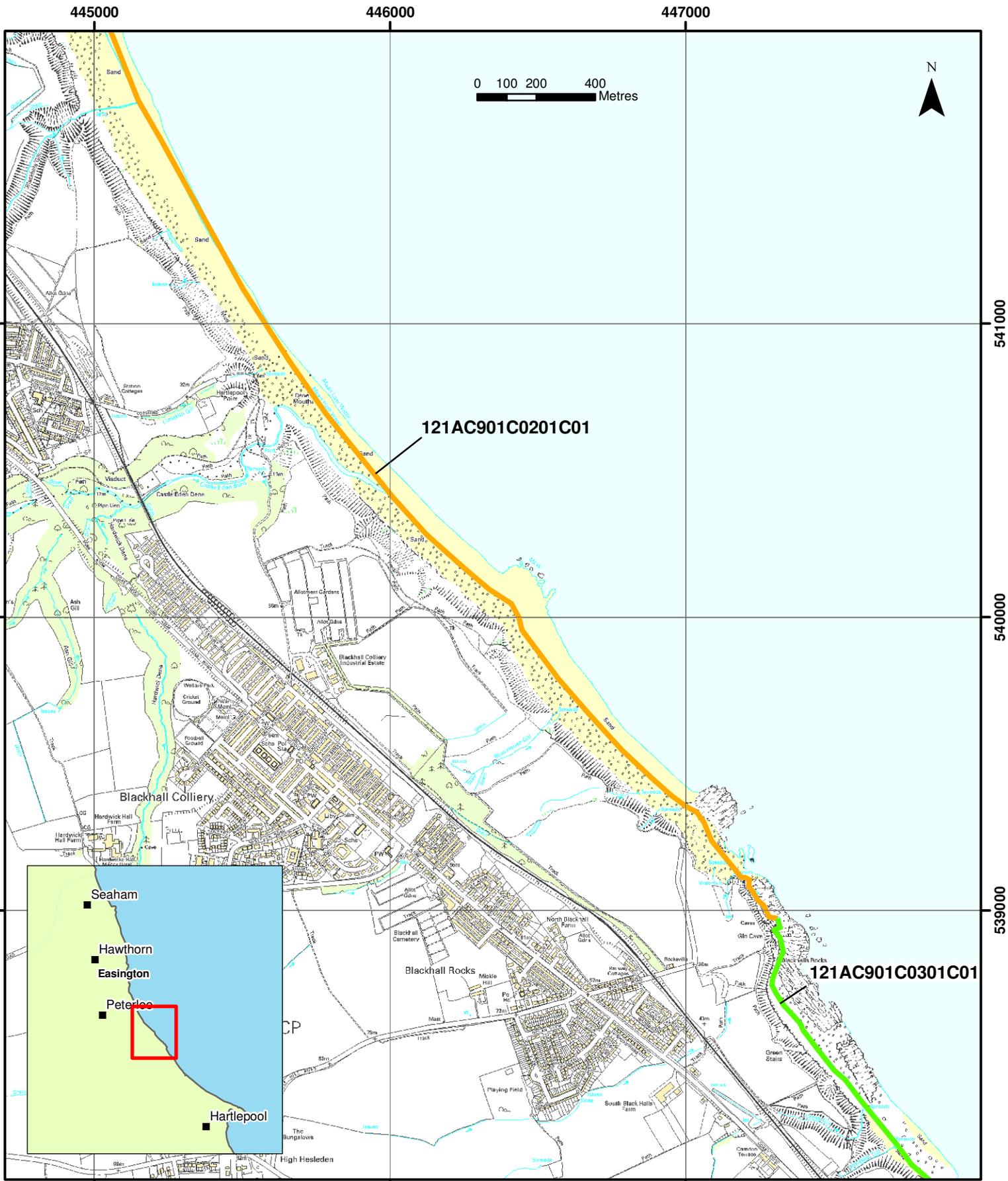
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 Approved by: NC Date: 28/05/2010



Legend

-  Asset location
-  NFCDD Asset Number

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

**Figure 1 - Map 4
 Durham County
 Council Frontage**

Asset Inspection
 Report 2010

Drawing Scale 1:15,000 at A4



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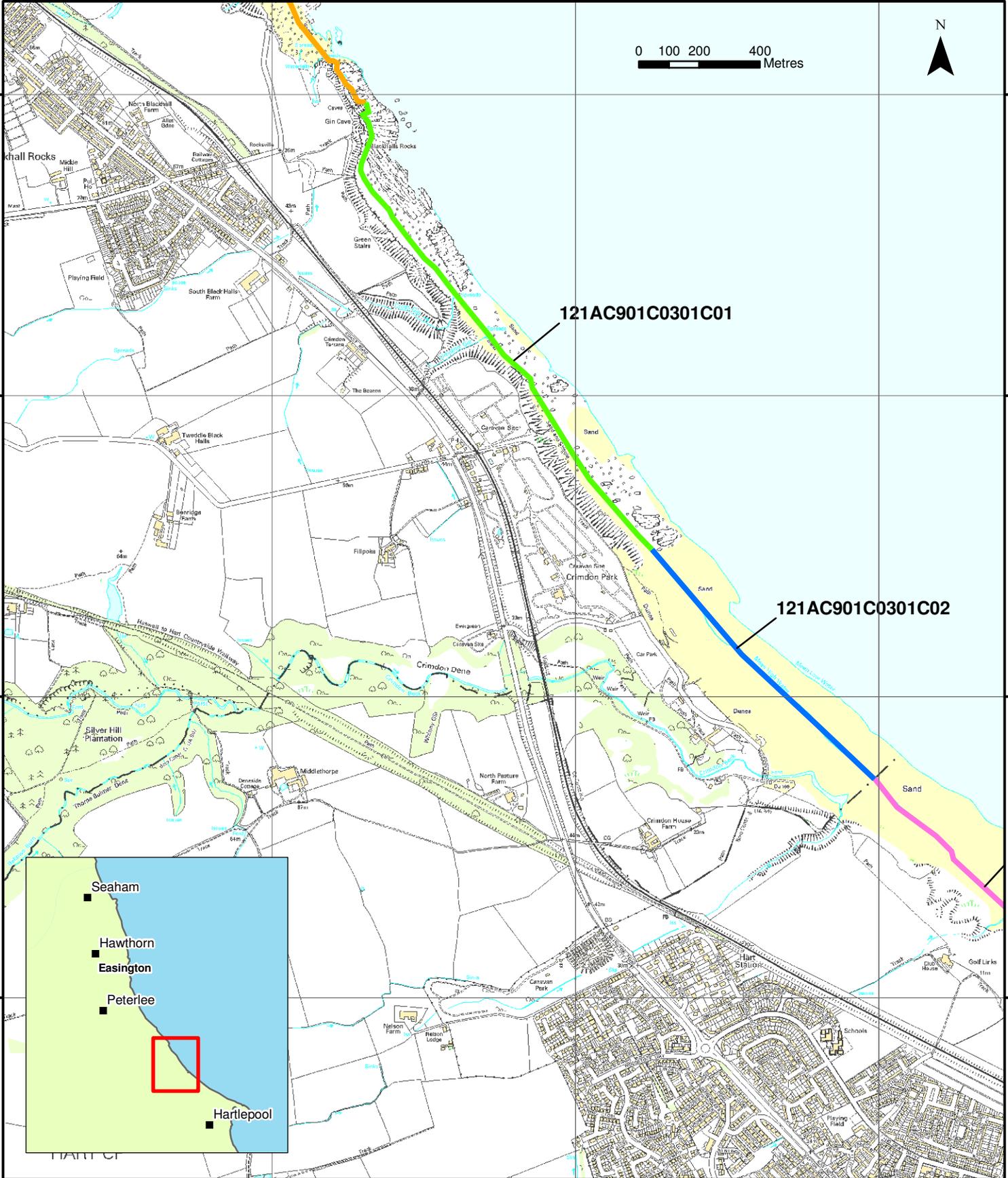
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447000

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Legend

-  Asset location
-  NFCDD Asset Number

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

**Figure 1 - Map 5
 Durham County
 Council Frontage**

Asset Inspection
 Report 2010

Drawing Scale 1:15,000 at A4



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