National Character Area profile:

41. Humber Estuary

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Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper[1], Biodiversity 2020[2] and the European Landscape Convention[3], we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

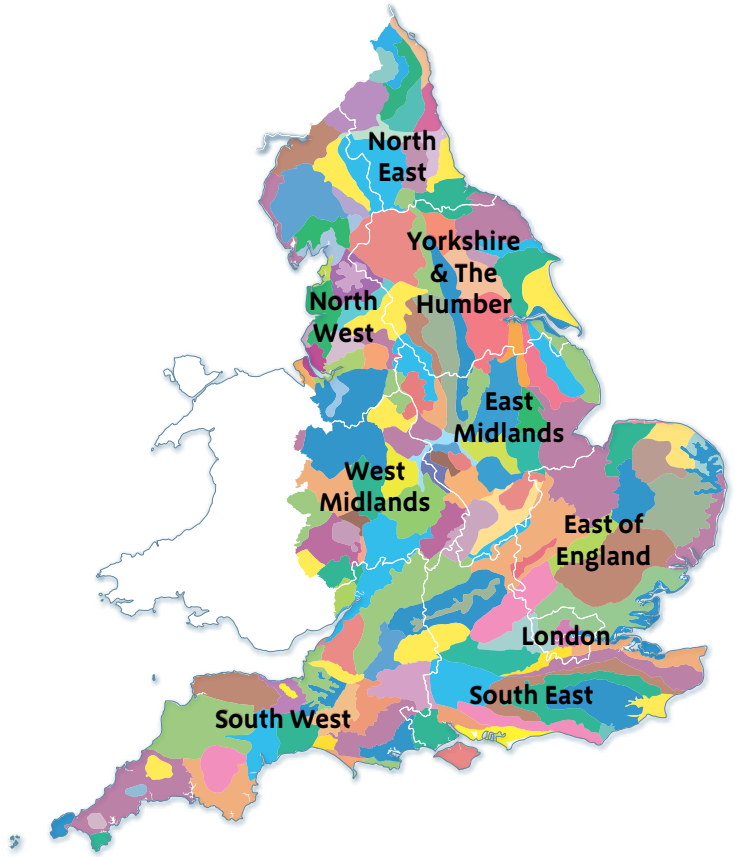
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and encourage broader partnership working through Local Nature Partnerships. The profiles will also help to inform choices about how land is managed and can change.

Each profile includes a description of the natural and cultural features that shape our landscapes, how the landscape has changed over time, the current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

NCA profiles are working documents which draw on current evidence and knowledge. We will aim to refresh and update them periodically as new information becomes available to us.

We would like to hear how useful the NCA profiles are to you. You can contact the NCA team by emailing **ncaprofiles@naturalengland.org.uk**

National Character Areas map



[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: **www.official-documents.gov.uk/document/cm80/8082/8082.pdf**)

[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: **www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf**)

[3] European Landscape Convention, Council of Europe (2000; **URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm**)

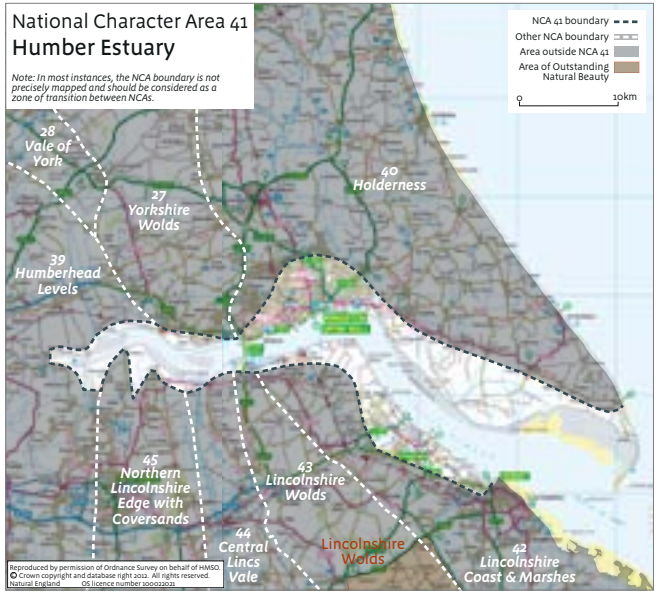
Summary

The Humber Estuary National Character Area (NCA) focuses on the open and expansive waters of the Humber where it flows in to the North Sea and the adjacent low-lying land. Several major rivers flow into the Humber, including the Trent, Don, Aire, Ouse and Hull, thus draining one-fifth of England. This is a low-lying estuarine landscape, with extensive stretches of intertidal habitats including mudflats, salt marsh and reedbeds, coastal dunes and wetlands along the side of the estuary. The estuary is of international significance, as a Ramsar site and is designated as a Special Protection Area for the large flocks of overwintering, migratory and breeding birds. The estuary is also designated as a Special Area of Conservation for its geomorphology and range of inter-tidal habitats, its lampreys and breeding colonies of grey seals. The area is particularly important for its dynamic geomorphological processes, the most notable of which form the ever-changing, long, remote Spurn peninsula, now designated as Heritage Coast.

The adjacent land has largely been reclaimed, resulting in large fields bounded by ditches, which form high-quality arable cropping land. There is very little woodland in the rural areas, where the many ditches form important networks linking the few other semi-natural habitats.

There are strong contrasts within this landscape. Much of it is open and expansive, with long views and tranquil and remote places, such as Spurn Point, Blacktoft and Skitter Ness, or quiet rural areas dominated by farming. These areas contrast with the large towns such as Hull and Immingham, with the industrial complexes, and with the estuary itself which is a busy trading route.

Key challenges include integrating the development pressures associated with the towns and ports with the protection and enhancement of the landscape and the internationally significant habitats and species. Rising sea levels are another challenge which, when combined with flood flows in the many big rivers that flow into the estuary, can cause major flood events. Addressing the coastal squeeze that is affecting the important intertidal habitats is another challenge, as is understanding and allowing the natural dynamic estuarine processes, in particular those that shape the Spurn peninsula.



Click map to enlarge; click again to reduce.

Statements of Environmental Opportunity

- **SEO 1:** Protect and enhance the dynamic and inspiring estuarine and coastal landscape with its interrelated habitats of sand dunes, salt marsh, reed beds, saline lagoons and mudflats, extending the internationally important habitats and the wildlife dependent upon them, while addressing coastal squeeze, climate change and dynamic coastal processes.

- **SEO 2:** Encourage a strategic approach to the planning of land uses around the estuary to address the pressures of climate change and development, ensuring that natural processes continue to function, the estuary's biodiversity value is protected and enhanced, and its open and expansive character is retained.

- **SEO 3:** Work with landowners and managers to incorporate more habitats and features into the farmed landscapes that improve biodiversity, address water quality and availability, and contribute to landscape character.

- **SEO 4:** Improve green infrastructure links between urban and rural areas, and seek opportunities for public enjoyment of the open, expansive landscape and its dynamic coastal features and wildlife .

- **SEO 5:** Protect, record and manage the cultural and historic landscape associated with the history of the area as a longstanding key communication and trading route.

The farmland is low-lying and flat, with few hedgerows and occasional small woodlands sheltering the large farmsteads.

Description

Physical and functional links to other National Character Areas

The Humber Estuary is one of Britain's largest estuaries and drains one-fifth of the land mass of England. Several major rivers thus drain into the Humber upstream, including the Don, Aire and Ouse, while the rivers Trent, Hull and Ancholme join the estuary within the area. Actions and measures taken upstream will therefore impact on the estuary, just as high tide levels in the estuary will affect the tidal stretches of the rivers flowing in. Management of the upper stretches of the River Hull in the Holderness NCA, will be key to alleviating flood risk in the city of Hull itself, while the managed realignment of the banks, especially in the upper estuary in the Humberhead Levels NCA, can increase the capacity of the estuary to hold both river and tidal floodwaters.

Spurn Point with its lighthouses and control tower forms a distinctive horizon, seen across the open water and extensive saltmarshes.

The estuary forms an important ecological corridor, in particular for salmonids accessing spawning grounds in the Ouse and Trent. It also supports a large grey seal colony at Donna Nook, just down the coast within the Lincolnshire Coast and Marshes.

The open water of the estuary has high suspended sediment loads which, as the tides go in and out, feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sand flats, saline lagoons, salt marsh and reedbeds. Sediment from the North Sea and from eroding soft coastlines further up the coast is needed to contribute to the constant reforming of the Spurn peninsula.

There is a major aquifer within the underlying Chalk, supplying large urban areas, major industrial complexes and the productive agriculture within both the NCA and adjacent NCAs. The adjacent NCAs –notably Humberhead Levels, Holderness and Lincolnshire Coast and Marshes – also provide important roosting and foraging areas to support the internationally significant bird populations.

The elevated rolling hills of the Yorkshire Wolds to the north and the Lincolnshire Wolds to the south are clearly visible from the low-lying land within the NCA, while also providing expansive views out over the estuary.

The estuary is a very busy waterway, with both passenger and commercial traffic accessing the many ports both within the estuary and upstream. It is thus a key link to north-west Europe. Historically, however, the wide estuary has had limited connections between the north and south sides, but these are now linked by the Humber Bridge.

Reedbeds are one of the important estuarine habitats, and provide valuable shelter for birds and mammals including otters.

Distinct areas

Spurn Point, a 5 km long sand and shingle spit.

Key characteristics

- Expansive, flat, low-lying estuarine landscape dominated by the open water of the Humber, with an ever-changing character due to the weather and tides.
- Underlying bedrock of Cretaceous Chalk exposed as cliffs where the estuary cuts through between the Yorkshire and Lincolnshire Wolds.
- A predominantly reclaimed, formerly inter-tidal landscape with high-quality soils giving rise to productive arable farming, within large rectilinear fields with boundaries formed by dykes, drains and embankments, and with very little tree cover.
- Large, dispersed farmsteads and small villages on higher land are set within a quiet rural landscape.
- Internationally important estuarine, intertidal and coastal habitats, influenced by the constant processes of accretion and deposition forming mudflats, salt marsh, saline lagoons, sand flats and sand dunes, which support large numbers of breeding and overwintering birds, grey seals and lampreys.
- The unique peninsula of Spurn Point, with its mudflats and sand dunes constantly responding to dynamic coastal processes, provides birdwatching of international interest within a wild and remote landscape.
- Big skies and open views over the estuary, mudflats and salt marshes, where flood embankments allow, with views of extensive industrial installations especially on the south bank.
- Quiet rural areas and the estuary itself contrast distinctly with urban and industrial influences around Hull and around the major ports, especially on the south bank.

The Humber Estuary is of international significance for its estuarine habitats, such as saltmarsh.

Much of the land is reclaimed and protected by floodbanks, with high quality soils supporting productive agriculture.

The Humber Estuary today

The Humber Estuary is one of the largest river estuaries in Britain. Flowing east, the River Humber is at first constrained by the elevated land of the chalk uplands of the Yorkshire Wolds and Lincolnshire Wolds but then opens up into a wide and expansive stretch of open water before joining the North Sea beyond Spurn Point. High flood banks contain the estuary but the open waters and long views provide the dominant focus within much of the area. On the north bank, there are extensive areas of low-lying flat and productive farmland alongside the urban area of Hull, its major passenger port and its industrial complexes. On the south side, there are further ports and extensive industrial complexes of oil and chemical tanks, towers, chimneys, warehouses and storage areas, with some agricultural land.

The waters of the Humber Estuary contribute to a landscape that is always changing due to the tidal movements, exposing extensive mudflats at low tide, and the effects of the changing weather. Large ships, including ferries, container ships and cargo ships, are constantly moving in and out of the estuary. There are a number of prominent and iconic features in this open estuarine landscape including the Humber Bridge, Hull's tidal surge barrier, The Deep on the water's edge at Hull, and the lighthouses and Vessel Traffic Services control tower on Spurn Point. Some of the finest views of the estuary come from the Humber Bridge which links the north and south banks.

Most of the farmed landscape is open and expansive with large regular fields, large farmsteads with big sheds, few visible field boundaries and very limited tree cover. This is particularly so on the north side, where much of the land has been formed by reclamation of salt marshes from the estuary, by drainage of wet alluvial soils or by the process of 'warping'; the seasonal tidal impoundment of farmland with water rich in silt. As a result, the farmland is fertile, drained by a network of ditches, and supports productive arable farming.

In other areas, on slightly higher drier land, hedgerows are more frequent and create a slightly more enclosed landscape, but always influenced by the nearby wide expanse of water in the estuary. Here, there are scattered small villages and those traditional buildings remaining are built of soft red brick, produced from local brick works at Beverley to the north and at Barton Clay Pits on the south bank. Some buildings closer to the coast are traditionally built with cobbles.

Within the predominantly arable farmland, there are areas of saltmarsh and reedbeds along tidal channels which cross the drained marshes, while the Barton Clay Pits provide open water, reedbeds and other wetland habitats, making them of value for birds and other wildlife, such as otters and water voles.

Around Hull, which lies where the River Hull joins the estuary, are varied urban fringe land uses, along with market gardens. The industrial complexes – with their oil and gas refineries, warehouses, towers, chimneys and lighting columns – are a major and distinctive feature of the estuary, especially on the south bank around Immingham and towards Grimsby, and around Hull on the north bank, which also has a passenger port.

These complexes contrast strongly with the remote and distinctive peninsula of Spurn Point, a long sand and shingle spit which extends out across the mouth of the Humber Estuary, providing some shelter from the North Sea. It comprises sandy beaches on the east side, which are exposed to the action of the North Sea, while on the sheltered west side sediment has been deposited, and extensive mudflats and saltmarshes have developed. The form of the

Spurn peninsula responds constantly to wave action and the deposition of sediments brought down from the Holderness coast, and tends to move westwards over time. The peninsula supports colonies of breeding little terns and offers birdwatching experiences of international interest, especially during bird migration, and is designated as a National Nature Reserve. The distinctive landscape and history of the wider area is reflected through its recognition as Heritage Coast.

In the estuary, mudflats cover extensive areas and are exposed at low water. The estuary is also designated a Special Protection Area as it provides significant feeding, roosting and nesting areas for overwintering, migratory and breeding birds; large flocks of waders can often be seen feeding and flying along the shorelines. The estuary regularly supports over 150,000 waterbirds in the non-breeding season, including important populations of golden plover, black-tailed godwit, bar-tailed godwit, ringed plover and lapwing. Other species include wigeon, teal, mallard, shelduck, knot, oystercatcher, avocet, sanderling, dunlin, ruff, curlew, redshank, and turnstone. Bitterns now regularly breed in the reedbeds and marsh harriers hunt overhead. Many of these birds rely upon areas adjacent to this NCA for roosting and feeding.

The estuary is a Ramsar site and Special Area of Conservation, and thus of international importance, for its dynamic coastal and intertidal geomorphological processes and habitats, notably coastal lagoons, fixed dunes, stable dunes, shifting dunes and mudflats and sand flats, and is the third largest Site of Special Scientific Interest in England. It supports both river and sea lamprey, and a large breeding colony of grey seals. It is an important migration route for salmon and sea trout accessing their spawning grounds in the Ouse and Trent. The vegetation is also of interest as several scarce plants occur here at or close to the northern or southern limits of their range on the east coast. Work is being undertaken to address the coastal 'squeeze' of intertidal habitats between rising sea levels and flood defences and, in some instances, to increase the capacity of the estuary to hold flood water, through realigning the flood banks, such as at Alkborough.

The elevated Chalk ridge that forms the Yorkshire and Lincolnshire Wolds meets the estuary in the west of the NCA, creating low cliffs of geological interest and also providing striking views out over the expanse of water.

The landscape through time

Some 100,000 years ago the coastline was further west, along the line of the Cretaceous Chalk, which forms the raised ridges of the Yorkshire and Lincolnshire Wolds and underlies the rest of the area. During the last ice age, an advancing ice front blocked the mouth of the River Humber, holding back the water to form a huge lake extending inland, the Lake Humber. As the ice retreated, the meltwater poured out over the till (boulder clay), sands and gravels deposited by the ice sheet, cutting a channel to escape out to the sea and forming a wide, shallow river valley.

A moraine ridge, now called the Binks, was deposited seaward of the tip of the Spurn peninsula, creating sheltered conditions thus allowing shingle and sands to settle. Sand dunes formed on these deposits, raising the level above the highest tides and enabling vegetation to encroach, thus creating the peninsula. The peninsula remains in a constant state of flux, responding to wave action and the deposition of sediments, with the southern end protected within the curve of the Binks and the northern end attached to the Holderness coast.

The sea levels rose slowly after the ice age, vast quantities of sand and gravel were pushed onto the coast, and the Humber changed from a river valley to a saltwater estuary. Now the underlying geology is largely obscured by the Pleistocene deposits, with cliffs of Cretaceous Chalk exposed where the Humber flows between the Yorkshire and Lincolnshire Wolds, forming a flooded valley.

Archaeological evidence shows that the estuary has been a key trade and communication route between the North Sea and the Pennines, and also to the Midlands via the Trent, since prehistoric times. Significant palaeo-environmental and archaeological evidence is preserved within the wetland soils. For instance, bronze-age boats, suitable for both river and sea use, and fishtraps have been discovered in the intertidal areas. There is also evidence of early settlement on higher, drier land, while the lower wetlands provided fishing and fowling as well as summer grazing for the surrounding settlements.

As the northern frontier of the Roman Empire, several Romano-British settlements were established nearby, notably Brough. Place names indicate that both the Saxons and Danes settled in the area. The Humber continued to have great importance for trade and communication, with populations and wealth increasing through the medieval period.

There is evidence on the north bank that some drainage of the marshes began as long ago as 180 AD, and local abbeys began to promote drainage schemes in the 12th century. However, from the 17th century, the processes of coastal reclamation, drainage and enclosure had a significant impact on the rural landscape on the north side of the estuary. Dutch engineers carried out extensive drainage works, including cutting new drainage channels, enlarging watercourses, constructing flood protection berms and installing sluices and pumping systems, thus effectively reclaiming extensive areas from the sea. On the south side, flood defences were built to protect the developing towns and industrial areas.

Spurn Point, a National Nature Reserve, is a remote spit of land, constantly shifting in response to coastal processes.

The practice of warping – flooding areas with tidal waters carrying fertile alluvial silt – was also introduced by the Dutch in the 18th century. Warping drains, with their high flood embankments, are still visible today although the practice has long ceased. Later, Parliamentary enclosures produced the landscape of regular, geometric fields, mostly enclosed by dykes, with associated large brick-built isolated farmsteads, as seen at Sunk Island. Brick pits, based on Pleistocene clays, were excavated at Barton, while shingle was removed from the Spurn peninsula, resulting in increased erosion, which led to the construction of protective groynes, thus affecting the natural processes of accretion and erosion.

In the 20th century, the proximity of deep water enabled the expansion of major cargo ports.

In the 16th and 17th centuries, the area declined in prosperity as a result of competition for trade and improvements to inland transport systems. Hull, however, prospered and became the principal port and town in the area, with fine municipal architecture built in the 19th century in the town centre. Defensive structures were also constructed from this period onwards to protect the coastline from attack.

The Humber Estuary's importance for defence continued with a late-19th-century coastal artillery battery and minefield control centre built at Paull Point, followed in the 20th century by a First World War acoustic mirror near Kilnsea and two forts at the estuary mouth, then the construction of Second World War anti-aircraft batteries, along with bombing decoys for the main Humber docks at Little Humber. Spurn Point has always been important as a prominent location, with a 19th-century lighthouse and now a tower for the control of vessel movements, a lifeboat station and a bird observatory.

The proximity of deep water, especially on the south side of the estuary, enabled the expansion of several ports which now handle high volumes of goods (approximately 30 per cent of Britain's shipping tonnage) going both in and out of the country. Immingham has developed as a major container port, as well as importing cars. The associated expansion of industrial complexes, transport links and urban areas has brought with it a loss of tranquillity. The building of motorways and the construction of the Humber Bridge in 1981 have linked the ports and industrial areas with their hinterlands, reducing the separation between the north and south banks and encouraging further development.

The uptake of agri-environment schemes in this area has not been high, with most relating to the management and restoration of wetland habitats such as salt marsh, inter-tidal habitats and reed beds. Farms remain large, averaging 120 ha, and there has been a slight decline in grass area in favour of oilseeds and vegetables. In an area dominated by arable cropping, livestock numbers are low, with a shift from cattle to sheep and a significant reduction in pig numbers, between 2000 and 2009.

The Humber Bridge, built in 1981, finally linked the north and south sides of the estuary.

Ecosystem services

The Humber Estuary NCA provides a wide range of benefits to society. Each is derived from the attributes and processes (both natural and cultural features) within the area. These benefits are known collectively as 'ecosystem services'. The predominant services are summarised below. Further information on ecosystem services provided in the Humber Estuary NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** With 37 per cent of the land at Grades 1 and 2, and 36 per cent at Grade 3, the area is highly productive. Arable farming is predominant, with high concentrations of cereals and oilseeds. The area is also important for pig rearing. The loamy and clayey soils of the coastal flats with naturally high groundwater have the potential to continue to support highly productive agriculture but this is dependent upon pump drainage and protection from floods. However, over-abstraction is increasing the risk of saline intrusion.

Regulating services (water purification, air quality maintenance and climate regulation)

- **Climate regulation:** Significant carbon storage is provided by extensive areas of saltmarsh, reedbeds, mudflats and coastal marine sediments.

- **Regulating water quality:** Measures to reduce the demand for groundwater within the arable farmland, and thus the risk of saline intrusion, are a priority. The quality of the water within the estuary itself is highly dependent upon the quality of the water of the rivers upstream.

- **Regulating water flow (flooding):** The entire NCA lies within the 'floodable area' of the Humber Estuary, at risk of being flooded by rising sea levels, and in particular by a storm surge in the North Sea combined with high river levels. Reflecting this risk, essentially the entire stretch of the estuarine shore is protected by flood defences. These give rise to 'coastal squeeze', as intertidal habitats are lost between rising sea levels and the flood banks, which needs to be addressed by managed realignment to enable the continued expansion of intertidal habitats.

  The complex processes of deposition and erosion within the estuary are linked to the coastal processes. Sediments from the North Sea and from the eroding Holderness cliffs to the north are drawn in and out of the estuary and contribute to the continual changing patterns of deposition. In particular, these sediments form the Spurn Head peninsula at the mouth of the estuary which in turn provides shelter, encouraging the accretion of extensive mudflats on the east side. The supply of sediments thus needs to be maintained.

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** Sense of place, inspiration and escapism are all provided by the expansive, flat, low-lying estuarine landscape dominated by the Humber, with large open skies, the exposed Spurn peninsula, and remote, quiet wetlands alongside the estuary. The tidal nature of the estuary provides an ever-changing scene, often with large flocks of birds wheeling past, and the Humber Bridge, industrial complexes and other iconic structures forming distinctive focal points.

- **Tranquillity:** There are strong contrasts between the very busy areas of Hull and the industrial complexes along the south bank, and the tranquil areas of the mudflats and estuarine landscape on the north side, and the upper stretches of the estuary. Spurn Head retains an 'other-worldly' quality, all but cut off from the mainland.

- **Biodiversity:** The Humber Estuary is of international significance, with most of it designated as a Ramsar site and as a Special Area of Conservation for its extensive intertidal habitats such as mudflats, sands, coastal lagoons and sand dunes, and its populations of grey seals and lampreys. It is also a Special Protection Area for its breeding, migratory and overwintering bird populations, and is the third largest Site of Special Scientific Interest in England.

- **Geodiversity:** The Humber Estuary is of international importance for its complex patterns of erosion and accretion, with the Spurn Peninsula an outstanding example of a dynamic spit system, with a long historical map record.

Floodbanks protect the extensive industrial complexes, but the wide open spaces are inspirational and attract walkers and birdwatchers.

Statements of Environmental Opportunity

SEO 1: Protect and enhance the dynamic and inspiring estuarine and coastal landscape with its interrelated habitats of sand dunes, saltmarsh, reed beds, saline lagoons and mudflats, extending the internationally important habitats and the wildlife dependent upon them, while addressing coastal squeeze, climate change and dynamic coastal processes.

For example, by:

- Responding to rising sea levels by seeking opportunities to realign flood defences or provide soft flood defences, thus allowing the development of intertidal habitats to compensate for any losses arising from coastal squeeze, maintaining their role in storing carbon and ensuring that new sites are managed to enhance the biodiversity value of the estuary and contribute to its expansive landscape character.
- Seeking opportunities to increase the extent of intertidal habitats – including saltmarsh, reedbeds and mudflats – to provide effective defences against wave energy and to protect and enhance biodiversity value.
- Enabling the natural and dynamic coastal and estuarine processes to continue, so that the coastline and estuary can respond to the constantly changing patterns of accretion and erosion.
- Enabling the Spurn peninsula to evolve as naturally as possible with limited intervention, maintaining access to key facilities with minimal interruption to natural coastal processes.
- Monitoring and researching coastal processes to improve understanding, and working with partners to find ways of enabling these dynamic processes to ensure no net loss of features.
- Providing access to sites of geological or geomorphological interest, and providing interpretation, to raise awareness and improve understanding of the dynamic processes under way.
- Raising awareness of the importance of the roosting and feeding areas for birds around the estuary, ensuring that they are adequately protected and managed.

SEO 2: Encourage a strategic approach to the planning of land uses around the estuary to address the pressures of climate change and development, ensuring that natural processes continue to function, the estuary's biodiversity value is protected and enhanced, and its open and expansive character is retained.

For example, by:

- Supporting the strategic approach to assimilating new industrial development, in particular on the south bank, to ensure co-ordination of changes so that the internationally significant biodiversity is protected and enhanced.
- Ensuring that compensation and mitigation sites are identified, established and functioning effectively well before development goes ahead, thus ensuring the continuation of resources for wildlife.
- Ensuring that planning decisions adequately address the vital role that areas landward of the flood defences play in supporting the internationally important bird populations, and that new wetlands and grasslands are established to form effective corridors and stepping stone habitats which extend the resources available to wildlife and enable species movement.
- Carefully planning new industrial complexes and structures so that they are integrated into local landscape character, by retaining key views, landscape features and sites of nature conservation value, and creating new habitats such as wetlands and grazing marsh, thus ensuring that industrial areas are more 'permeable', with networks of connected habitats.
- Ensuring that light spill is minimised through careful lighting design, particularly in the more tranquil and undisturbed areas.
- Avoiding development in remote and tranquil areas, in particular protecting the remote qualities of Spurn Point Heritage Coast.

SEO 3: Work with land owners and managers to incorporate more habitats and features into the farmed landscapes that improve biodiversity, address water quality and availability, and contribute to landscape character.

For example, by:

- Encouraging the creation and management of permanent grass field margins and grass buffers to watercourses, thus reducing nutrient and sediment run-off.
- Taking opportunities to link and expand semi-natural habitats, especially grazing marsh and wetlands, thus creating strong habitat networks, providing corridors and stepping stones which will increase resilience to climate change by reducing fragmentation and enabling species movement.
- Encouraging the creation and management of fresh water habitats, wet grasslands and brackish water habitats to extend the areas available as well as compensating for those lost through rising sea levels, to strengthen biodiversity interest, enable species movement and improve infiltration of rain water.
- Conserving the network of drains, ditches and dykes and managing them so that they form effective habitats, encouraging more emergent vegetation and strengthening their contribution in supporting wildlife and as landscape features.
- Manage pumped drainage in such a way as to support the network of ditch habitats and to avoid drawing in saline waters.
- Encouraging selection of crops that will reduce demand for irrigation, and addressing demand for water – for instance through increasing on-farm water storage –thus reducing the risk of saline intrusion into groundwater.
- Encouraging the introduction of grass margins, pollen and nectar strips, and grass buffers along watercourses, to increase sources of support for pollinating insects as well as improving infiltration of rain water.
- Encouraging cultivation practices that will assist with the build-up of organic content of the soils as well as provide habitats for farmland birds and insects, such as including fallow within rotations, over-wintering stubbles, and pollen and nectar strips.

SEO 4: Improve green infrastructure links between urban and rural areas, and seek opportunities for public enjoyment of the open, expansive landscape and its dynamic coastal features and wildlife.

For example, by:

- Incorporating green spaces in new developments – in particular around the urban areas of Hull and Immingham, connecting semi-natural habitats where possible to increase their resilience to climate change impacts, and addressing sustainable drainage, while also improving access to the natural environment for urban populations.
- Identifying opportunities to create new routes, including permissive routes, especially around Hull, linking with green spaces and rights of way within the city and thus enabling the urban population to access the countryside and the country parks.
- Identifying opportunities to create new circular routes or links to existing rights of way, notably the Yorkshire Wolds Way and the Trans Pennine Trail.
- Seeking ways of enabling more people to benefit from the high level of inspiration to be gained from proximity to the Spurn peninsula and open estuary with its long views, wildlife and dynamic geomorphological features, in particular by gaining access to raised flood banks (where this does not disturb important bird populations) and linking to the new coastal access route that will go up to the Humber Bridge.
- Encouraging sustainable recreational and educational access to enable more people to understand and appreciate the Humber Estuary and its landscape, historic interest, wildlife and its functions and dynamic nature, bringing attention to and interpreting the realignment sites.

SEO 5: Protect, record and manage the cultural and historic landscape associated with the history of the area as a longstanding key communication and trading route.

For example, by:

- Preserving important coastal and intertidal palaeo-environmental and archaeological evidence.
- Protecting significant and iconic historic features, including those relating to the different periods of drainage and the coastal and military defence structures.
- Identifying those historic features that are vulnerable to coastal processes and sea level rise, and ensuring that they are recorded and data is captured.
- Encouraging the use of local materials such as soft red brick, pantiles and Holderness cobbles, in restoring vernacular buildings, traditional farm buildings, water management structures and historic features.
- Managing sites of historic interest, such as drainage structures, the early brick-making and rope-making works, and military defences, and making them accessible to the public where appropriate, so that the role of the area can be understood and enjoyed.

Supporting document 1: Key facts and data

Total area: 27,950 ha

1. Landscape and nature conservation designations

The long spit of land at the mouth of the Humber Estuary is recognised as Spurn Head Heritage Coast, covering 342 ha (1 per cent of NCA).

Source: Natural England (2011)

1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation designations:

Tier	Designation	Name	Area (ha)	Percentage of NCA
International	Ramsar	Humber Estuary	1,478	5
European	Special Protection Area (SPA)	Humber Estuary SPA	1,473	5
	Special Area of Conservation (SAC)	Humber Estuary SAC	1,143	4
National	National Nature Reserve (NNR)	Spurn Point NNR, Far Ings NNR	162	1
National	Site of Special Scientific Interest (SSSI)	A total of 3 sites wholly or partly within the NCA	1,542	5

Source: Natural England (2011)

Please note: (i) Designated areas may overlap (ii) all figures are cut to Mean High Water Line, designations that span coastal areas/views below this line will not be included.

The designations of SPA and SAC largely overlap, and include extensive stretches of open water in the estuary (much of this is below the mean high water mark that denotes the NCA boundary). While physically not within NCA boundaries this is functionally part of the NCA.

There are 62 Local sites in the Humber Estuary covering 540 ha, which is 2 per cent of the NCA.

Source: Natural England (2011)

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm
- Details of Local Nature Reserves (LNR) can be searched: http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_search.asp
- Maps showing locations of statutory sites can be found at: http://magic.defra.gov.uk – select 'Designations/Land-Based Designations/ Statutory'

1.2 Condition of designated sites

A breakdown of SSSI condition as of March 2011 is as follows:

SSSI condition category	Area (ha)	Percentage of SSSI in category condition
Unfavourable declining	327	21
Favourable	763	50
Unfavourable no change	30	6
Unfavourable recovering	353	23

Source: Natural England (March 2011)

Details of SSSI condition can be searched at:
http://www.sssi.naturalengland.org.uk/Special/sssi/reportIndex.cfm

2. Landform, geology and soils

2.1 Elevation

This NCA comprises the land on both sides of the wide Humber Estuary, where it flows into the North Sea. It is mostly only a few metres above sea level, rising to a maximum of 65 m.

Source:Natural England (2010)

2.2 Landform and process

The area is flat and low-lying, with some small areas of higher land on both sides where the chalk ridge, that forms the Yorkshire Wolds to the north and the Lincolnshire Wolds to the south, cuts across the estuary. The NCA contains the open water of the estuary, which has high suspended sediment loads that feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reed beds.

Source: Humber Estuary Countryside Character description

2.3 Bedrock geology

The underlying bedrock is mainly Cretaceous chalk which forms the ridges of the Yorkshire and Lincolnshire Wolds. These run north south, cutting across the flow of the estuary. However, the chalk is only rarely exposed within the NCA. A breakdown of solid geology as a proportion of total land area is as follows: 86 per cent chalk; 9 per cent mudstone; 2 per cent mudstone, limestone interbedded and 1 per cent ironstone.

Source:British Geological Survey (2006)

2.4 Superficial deposits

There is a constantly changing and dynamic system of accretion and erosion along the coastline, creating intertidal and subtidal mudflats, sandflats, saltmarsh, reed beds within the estuary, and changing deposits and erosion of sand and sand dunes along the North Sea coast. Spurn is an outstanding example of a dynamic spit system, very unusual, if not unique in Europe, in that the massive supply of sediment resulting from the erosion of the Holderness coast to the north has enabled it to extend across the mouth of a macro-tidal estuary. There exists an exceptionally long historical map record and written accounts extending back to the 7th century. This record indicates that the spit continuously shifts its location in response to dynamic coastal processes, especially the ongoing erosion of the Holderness coast. A short stretch of cliff and foreshore at South Ferriby reveals exposures of Pleistocene sediments – boulder clays interbedded with silts and gravels. Resting on these are sandy chalk gravels of probable fluvio-glacial origin, and interpretation of the succession of these sediments is key to understanding the Late Pleistocene history of the region. Farmland within the character area is mostly reclaimed salt marsh consisting of silts, clays and sand.

Source:Humber Estuary Natural Area Profile; Humber Estuary Countryside Character description

2.5 Designated geological sites

Tier	Designation	Number of sites
National	Geological Site of Special Scientific Interest (SSSI)	0
National	Mixed Interest SSSIs	2
Local	Local Geological Sites	15

Source: Natural England (2011)

Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm

2.6 Soils and Agricultural Land Classification

Much of the agricultural land has been reclaimed from the estuary, especially to the north. Generally, the agricultural land is of good quality, with some areas of more fertile soils where there are glacial and alluvial drift deposits. The best quality land, grades 1 and 2, is largely on the north side of the estuary, on the reclaimed land, whilst the poorest quality, grade 4, is to be found on Spurn Point.

Source:Natural England (2010)

The main grades of agricultural land in the NCA are broken down as follows (as a proportion of total land area):

Agricultural Land Classification	Area (ha)	Percentage of NCA
Grade 1	352	1
Grade 2	10,102	36
Grade 3	8,395	30
Grade 4	347	1
Grade 5	0	0
Non-agricultural	282	<1
Urban	7,988	28

Source: Natural England (2010)

- Maps showing locations of sites can be found at: http://magic.defra.gov.uk – select 'Landscape' (shows ALC and 27 types of soils).

3. Key waterbodies and catchments

3.1 Major rivers/canals

The following major rivers/canals (by length) have been identified in this NCA.

Name	Length in NCA (km)
River Trent	n/a
River Ouse	n/a
River Hull	7
Holderness Drain	4
River Freshney	<1
New River Ancholme	<1
Old River Ancholme	<1
Market Weighton Canal	<1

Source: Natural England (2010)

Please note: other significant rivers (by volume) may also occur. These are not listed where the length within the NCA is short.

The Humber Estuary flows from west to east, and is the culmination of many large rivers that together drain some 20 per cent of the land area of England into the North Sea. Other watercourses have been constructed to drain the area, or to provide navigable routes for the transfer of goods.

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 18,745 ha, 67 per cent of NCA.

Source: Natural England (2010)

3.3 Water Framework Directive

Maps are available from the Environment Agency showing current and projected future status of water bodies at: http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains just 441 ha of woodland (1.6 per cent of the total land area). There are no ancient semi-natural woodlands within this NCA, which reflects the relatively recent reclamation of much of the land, and its use as productive agricultural land.

Source: Natural England (2010)

4.2 Distribution and size of woodland and trees in the landscape

Woodland cover is sparse and confined to just a few small woodlands on higher land on the south side of the estuary, and a few young plantations on the north side, reflecting the relatively recent reclamation of much of the land adjoining the estuary.

Source:Humber Estuary Countryside Character description

4.3 Woodland types

A statistical breakdown of the area and type of woodland found across the NCA is detailed below.

Area and proportion of different woodland types in the NCA (over 2 ha)

Woodland type	Area (ha)	Percentage of NCA
Broadleaved	352	1
Coniferous	20	<1
Mixed	10	<1
Other	59	<1

Source: Natural England (2010)

Area and proportion of ancient woodland and planted ancient woodland sites (PAWS) within the NCA.

Woodland type	Area (ha)	Percentage of NCA
Ancient semi-natural woodland	0	0
Planted ancient woodland sites (PAWS)	0	0

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

Field boundaries are predominantly formed by dykes and drains, sometimes combined with flood embankments, with just a few hedgerows on higher land.

Source: Humber Estuary Countryside Character Area description; Countryside Quality Counts (2003)

5.2 Field patterns

Fields are generally large and rectilinear, especially in the reclaimed areas on the north side.

Source: Humber Estuary Countryside Character Area description; Countryside Quality Counts (2003)

6. Agriculture

The following data has been taken from the Agricultural Census linked to this NCA.

6.1 Farm type

The majority of farms (51 no) are focussed on cereal production, with some general cropping (15 no), and 19 providing grazing for livestock. While there are currently no specialist pig farms, many farms do include pig rearing.

Source: Agricultural Census, Defra (2010)

6.2 Farm size

The farms are generally large, with just over 40 per cent over 100 ha in size, and only 9 per cent under 5 ha. Farms over 100 ha account for 87 per cent of the farmed land.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

2009: Total farm area = 13,634 ha; owned land = 7,591 ha
2000: Total farm area = 14,596 ha; owned land = 7,629 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

Cereal and oilseed rotations dominate this area, with some cash roots, vegetables and other arable crops. Only 16 per cent is under grass or uncropped.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

Agriculture is predominantly focussed on cropping, so there are few cattle or sheep. However, pig numbers are fairly high at over 26,000, but this has decreased from nearly 37,000 in 2000.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

Since 2000 the number of salaried managers has doubled to 22, and there has also been an increase in the number of part-time farm workers. There has been a corresponding decrease in the number of principal farmers, full time and casual workers.

Source: Agricultural Census, Defra (2010)

Please note: (i) Some of the Census data are estimated by Defra so may not present a precise assessment of agriculture within this area (ii) Data refers to commercial holdings only (iii) Data includes land outside of the NCA where it belongs to holdings whose centre point is recorded as being within the NCA.

7. Key habitats and species

7.1 Habitat distribution/coverage

The Estuary comprises a dynamic and changing system of accreting and eroding intertidal and subtidal mudflats, sandflats and other estuarine features. The estuary is of international importance for its coastal lagoons, fixed, shifting and stable dunes, mudflats and sand flats.

The Estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion along the tidal stretches of the rivers Ouse and Trent.

The Spurn Point peninsula is subject to the processes of erosion and accretion, with exposed sandy shores facing the North Sea to the east, and mudflats and saltmarsh on the sheltered east side.

The disused clay pits at Barton now support open water habitats along with reedbeds and other wetland habitats. There are extensive intertidal reedbeds at the confluence of the Trent and Ouse.

Wetland habitats are developing at Alkborough Flats, where the flood defences were realigned to increase the capacity of the Estuary in extreme flood events. There are a number of other smaller managed realignment sites in the NCA which are developing a range of intertidal habitats and provide compensation for losses due to coastal squeeze arising from increased sea levels, or as compensation for specific developments.

Source: Humber Estuary Natural Area Profile

7.2 Priority habitats

The Government's new strategy for biodiversity in England, Biodiversity 2020, replaces the previous Biodiversity Action Plan (BAP) led approach. Priority habitats and species are identified in Biodiversity 2020, but references to BAP priority habitats and species, and previous national targets have been removed. Biodiversity Action Plans remain a useful source of guidance and information. More information about Biodiversity 2020 can be found at; www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx.

The NCA contains the following areas of mapped priority habitats (as mapped by National Inventories). Footnotes denote local/expert interpretation. This will be used to inform future national inventory updates.

Priority habitat	Area (ha)	Percentage of NCA
Coastal floodplain grazing marsh	813	3
Reedbeds	483	2
Lowland meadows	233	1
Fens	213	1
Saline lagoons	142	1
Coastal sand dunes	111	<1
Broadleaved mixed & yew woodland (Broad habitat)	111	<1
Lowland dry acid grassland	96	<1
Mudflats	56	<1
Purple moor-grass & rush pastures	17	<1
Maritime cliff and slope	11	<1

Source: Natural England (2011)

Note that the boundary of the NCA is the mean high water mark and thus open water and marine areas are not included.

- Maps showing locations of priority habitats are available at: http://magic.defra.gov.uk – Select 'Habitats and Species/Habitats'

7.3 Key species and assemblages of species

- Maps showing locations of some key species are available at: http://magic.defra.gov.uk – Select 'Habitats and Species/Habitats'
- Maps showing locations of S41 species are available at: http://data.nbn.org.uk/

8. Settlement and development patterns

8.1 Settlement pattern

The area is dominated by the large conurbation of Kingston upon Hull on the north bank and the town and extensive industrial areas of Immingham and Immingham Docks on the south bank. These built up areas contrast with the sparsely populated rural areas especially on the relatively recently reclaimed land on the north bank, where there are scattered hamlets and small towns such as Easington and Kilnsea on slightly higher, drier land. The settlements of Hessle (on the north side) and Barton (on the south side) are linked by the Humber Bridge.

Source: Humber Estuary Countryside Character Area description; Countryside Quality Counts (2003)

8.2 Main settlements

The main towns within the NCA are: Kingston upon Hull, Immingham and Barton. The total estimated population for this NCA (derived from ONS 2001 census data) is: 274,567.

Source: Humber Estuary Countryside Character Area description; Countryside Quality Counts (2003)

8.3 Local vernacular and building materials

The most obvious structures within the NCA are the Humber Bridge and the extensive industrial installations near Hull and around Immingham. Those traditional buildings that do occur are built of soft red brick with red pantiles, sometimes including cobbles near the coast. Nearby Beverley, and Barton on the south bank, were the home of the early English brick making industry. Along the coast there are distinctive structures including lighthouses, concrete sea defences and the Vessel Traffic Services tower on Spurn Point.

Source: Humber Estuary Countryside Character Area description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

There is evidence of the Humber being used as a key communication route since the Bronze Age, with for example, a boat excavated at Ferriby that was suitable for coastal as well as inland transportation. Early settlements were located on slightly higher drier land, using the marshes for fishing, fowling and summer grazing. There is evidence of drainage undertaken in Roman times, but the main activity occurred from the 17th century, with Dutch engineers assisting with cutting drainage channels and installing sluice and pumping systems. The practice of warping – flooding areas with tidal waters carrying fertile alluvial silt – brought low lying areas into cultivation, and warping drains still remain as a feature in the landscape. Hull expanded as a port from the 12th century, with major expansion in 19th century, along with other major ports developing on the south bank. Several features linked to coastal defence remain, with late 19th century coastal artillery battery and minefield control centre at Paull Point, First World War acoustic mirror near Kilnsea Grange, and Second World War gun sites facing the Humber. There is a lighthouse and a traffic control tower on Spurn Point.

Source: Countryside Quality Counts Draft Historic Profile, Countryside Character Area description

9.2 Designated historic assets

This NCA contains the following numbers of designated heritage assets:

- 2 Registered Parks and Gardens covering 58 ha.
- 0 Registered Battlefield/s covering 0 ha.
- 25 Scheduled Monuments.
- 620 Listed Buildings.

Source: Natural England (2010)

More information is available at the following address:
http://www.english-heritage.org.uk/caring/heritage-at-risk/

http://www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

10. Recreation and access

10.1 Public access

- 1 per cent of the NCA 295 ha is classified as being publically accessible.
- One resource is the country parks, which comprise 73 ha, while there are 161 ha of National Nature Reserve and 72 ha of Local Nature Reserves, which are accessible.
- There are 216 km of public rights of way at a density of 0.8 km per km2.
- There are 0 National Trails with the Humber Estuary NCA. However, the Wolds Way starts on the north bank, and just over 4 km falls within this NCA.

Sources: Natural England (2010)

The table below shows the breakdown of land which is publically accessible in perpetuity:

Access designation	Area (ha)	Percentage of NCA
National Trust (Accessible all year)	0	0
Common Land	415	2
Country Parks	73	<1
CROW Access Land (Section 4 and 16)	0	0
CROW Section 15	0	0
Village Greens	0	0
Doorstep Greens	0	0
Forestry Commission Walkers Welcome Grants	32	<1
Local Nature Reserves (LNR)	72	<1
Millennium Greens	0	0
Accessible National Nature Reserves (NNR)	160	1
Agri-environment Scheme Access	12	<1
Woods for People	42	<1

Sources: Natural England (2011)

Please note: Common Land refers to land included in the 1965 commons register; CROW = Countryside and Rights of Way Act 2000; OC and RCL = Open Country and Registered Common Land.

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the least tranquil areas are, unsurprisingly, the city of Hull on the north bank, and Immingham and the industrial areas on the south bank, while the agricultural land on the north side, some stretches of the estuary and Spurn Point are all very tranquil.

A breakdown of tranquillity values for this NCA are detailed in the table below:

Tranquillity	Score
Highest value within NCA	107
Lowest value within NCA	-89
Mean value within NCA	-7

Sources: CPRE (2006)

More information is available at the following address:
http://www.cpre.org.uk/resources/countryside/tranquil-places

11.2 Intrusion

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows that that the city of Hull and the roads and industrial complexes around it are the most disturbed. A breakdown of intrusion values for this NCA are detailed in the table below.

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	20	27	25	+6
Undisturbed	55	44	46	-9
Urban	18	18	29	+11

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are the increase in disturbed areas, which are the urban areas and industrial complexes around Grimsby, Immingham and the south bank. Dark night skies are affected by the urban areas, but also particularly by the large scale lighting of the industrial complexes, which make them into intrusive yet striking features when viewed across the waters of the Estuary.

More information is available at the following address:
http://www.cpre.org.uk/resources/countryside/tranquil-places

Early attempts to control the movement of sand on the exposed shore of Spurn Point with groynes and fortified banks, simply interfered with the natural coastal processes.

12. Data sources

- British Geological Survey (2006)
- Natural Area Profiles, Natural England (published by English Nature 1993-1998)
- Countryside Character Descriptions, Natural England (regional volumes published by Countryside Commission/Countryside Agency 1998/1999)
- Joint Character Area GIS boundaries, Natural England (data created 2001)
- National Parks and AONBs GIS boundaries, Natural England (2006)
- Heritage Coast Boundaries, Natural England (2006)
- Agricultural Census June Survey, Defra (2000,2009)
- National Inventory of Woodland & Trees, Forestry Commission (2003)
- Countryside Quality Counts Draft Historic Profiles, English Heritage (2004)*
- Ancient Woodland Inventory, Natural England (2003)
- BAP Priority Habitats GIS data, Natural England (March 2011)
- Special Areas of Conservation data, Natural England (data accessed in March 2011)
- Special Protection Areas data, Natural England (data accessed in March 2011)
- Ramsar sites data, Natural England (data accessed in March 2011)
- Sites of Special Scientific Interest, Natural England (data accessed in March 2011)
- Detailed River Network, Environment Agency (2008)
- Source protection zones, Environment Agency (2005)
- Registered Common Land GIS data, Natural England (2004)
- Open Country GIS data, Natural England (2004)
- Public Rights of Way Density, Defra (2011)
- National Trails, Natural England (2006)
- National Tranquillity Mapping data, CPRE (2007)
- Intrusion map data, CPRE (2007)
- Registered Battlefields, English Heritage (2005)
- Record of Scheduled Monuments, English Heritage (2006)
- Registered Parks and Gardens, English Heritage (2006)
- World Heritage Sites, English Heritage (2006)
- Incorporates Historic Landscape Characterisation and work for preliminary Historic Farmstead Character Statements (English Heritage/Countryside Agency 2006)Detailed River Network, Environment Agency (2008)

Please note all figures contained within the report have been rounded to the nearest unit. For this reason proportion figures will not (in all) cases add up to 100%. The convention <1 has been used to denote values less than a whole unit.

Supporting document 2: Landscape change

Recent changes and trends

Trees and woodlands

- There is insignificant woodland cover, and there has been little recent change.

Boundary features

- Data from Countryside Quality Counts for the period 1999 to 2003 indicates that boundary features (notably ditches) have generally been neglected, with only 3 per cent of the total resources covered in a limited uptake of agri-environment agreements

- However, some 7 km of ditches and 6.6 km of hedges are under Environmental Stewardship agreements, as at March 2011.

Agriculture

- Rotations of cereals and oilseeds continue to dominate the agricultural production, with a decline of mixed and general cropping, a drop in pig numbers and a slight increase in larger farms since c.2000.

Settlement and development

- During the period 1999 to 2003 there was a moderately high rate of change arising from development, with some evidence of expansion of urban areas and industrial sites, especially around Immingham, Brough, Elloughton and Welton.

- Since 2003, industry and port development has continued to expand on both the south and north banks, including recent applications for extension of port handling and storage, and sites for turbine construction to supply off-shore windfarms.

- There has been a reduction in the extent of undisturbed land since the 1960s, due to the increase in urban areas and industrial complexes, in particular around Immingham.

Semi-natural habitat

- Between 1999 and 2003 the annual uptake of agri-environment agreements was low, with the most extensive uptakes in 2003 relating to the conservation of salt marsh, over-wintered stubble and spring / summer fallow.

- The managed re-alignment scheme at Alkborough Flats has resulted in an increase in wet pasture, reedbeds and open water.

Historic features

- It is estimated that 75 per cent of historic farm buildings remain unconverted, and approximately 85 per cent are intact structurally.

Coast and rivers

- In 2003 there were some agri-environment agreements related to the management and restoration of wetland habitats such as salt marsh, intertidal habitats, reed beds and conversion of sand dunes. The biological water quality in 1995 was predominantly good and was maintained as such. The chemical water quality in 1995 was predominantly poor, and remained unchanged.

- The capacity of the estuary to hold floodwaters has been increased recently by managed realignment schemes, notably the reversion of farmland at Alkborough to wet pasture, reedbeds and open water.

- There is a constantly changing and dynamic system of accretion and erosion along the coastline, creating intertidal and subtidal mudflats, sandflats and saltmarsh within the estuary, and changing deposition and erosion of sand and sand dunes along the North Sea coast. This is most marked with the constantly shifting form of the Spurn peninsula.

Minerals

- Clay has historically been extracted at Barton Pits, and there are some cement works on the south side, but otherwise there is no significant extraction of minerals in this NCA.

Drivers of change

Climate change

Climate change is likely to result in:

- More extreme weather events, in particular storm surges leading to increased flooding, both from higher tides and from increased flood flows down the several rivers feeding into the estuary, increasing the flood risk for adjacent land and causing significant alterations to patterns of erosion and deposition.

- Rise in sea levels, which when combined with the existing flood defences, will result in the further loss of intertidal habitats and other habitats such as reedbeds, floodplain grazing marsh, brackish and fresh water.

- The possibility of subsequent changes to erosion and accretion of sediments, due to the rise in sea levels, resulting in significant changes in the form of the Spurn peninsula.

- Changes in coastal habitats may affect feeding opportunities for birds.

- A longer growing season potentially leading to double cropping and warmer winters leading to new crops.

- Increasing demands for water, for both domestic use and irrigation, leading to possible depletion of aquifer.

Other key drivers

- The rapid urban regeneration and urban renaissance of Hull as a regional city and a provider of housing, jobs, public services and amenities will increase pressure on land, but also provide opportunities for incorporating green infrastructure.

- Economic development and diversification in the Humber Estuary sub area will be a key driver for growth, with new growth exploiting multimodal transport links, ports and urban centres. Hull and the ports on both the south and north banks are important as key economic links for trade with Europe and as a 'Global Gateway'.

- There is likely to be an increased need for infrastructure in relation to policies to optimize the use of ports and waterways, such as improving road and rail networks. In addition to the legal requirements to find compensation sites for any loss of biodiversity, the more strategic planned approach to accommodating further industrial expansion on the south bank may open up opportunities for enhancing biodiversity.

- There is an increasing need for renewable energy with potential combined heat and power plants, on-shore turbines, construction facilities for off-shore turbines, and trials for tidal power. Grid connections for large off-shore windfarms may affect the area around Killingholme and east of Hull.

Breached flood defences on the Humber below Alkborough have enabled reclamation to an inter-tidal habitat with reedbeds, lagoons and grazing areas.

- The coastal landscapes are dynamic and constantly changing, with sand and gravel deposits from the Holderness coast feeding Spurn Point and the shores within the Humber estuary. These processes need to be monitored to ensure the peninsula remains as a naturally evolving geomorphological feature.

- Sea level rise and coastal squeeze are likely to continue, resulting not only in loss of inter-tidal habitats but also fresh water and wetland habitats, and brackish water. For example, Far Ings NNR and similar habitats are likely to become inter-tidal within the next 50 years.[4] A strategic approach is underway and will identify and implement locations for managed realignment to provide compensatory habitat for intertidal losses. Managed realignment sites will also be needed to compensate for the loss of designated intertidal habitats resulting from development, as at Chowder Ness, Welwick and Paull Holme Strays. Future developments on the south bank may require agricultural land on the north bank to be converted to intertidal habitats.

- Other habitats such as floodplain grazing marsh, reedbeds, brackish and freshwater habitats may also be affected by coastal squeeze, and opportunities will need to be sought to replace these.

[4] Humber Flood Risk Management Strategy, Environment Agency, 2008

Supporting document 3: Analysis supporting Statements of Environmental Opportunity

The following analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for this NCA. These are underpinned by supporting services such as photosynthesis, nutrient cycling, soil formation and evapo-transpiration. Supporting services perform an essential role in ensuring the availability of all ecosystem services.

Biodiversity and geodiversity are crucial in supporting the full range of ecosystem services provided by this landscape. Wildlife and geologically-rich landscapes are also of cultural value and are included in this section of the analysis. This analysis shows the projected impact of Statements of Environmental Opportunity on the value of nominated ecosystem services within this landscape.

Julian's Bower Maze sited at Alkborough overlooking the Humber Estuary at the Trent Falls the confluence of the rivers Ouse and Trent.

Statements of Environmental Opportunity	Ecosystem service: Food provision	Timber provision	Water availability	Genetic diversity	Biomass energy	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place/ inspiration	Sense of history	Tranquillity	Recreation	Biodiversity	Geodiversity
SEO 1: Protect and enhance the dynamic and inspiring estuarine and coastal landscape with its interrelated habitats of sand dunes, saltmarsh, reed beds, saline lagoons and mudflats, extending the internationally important habitats and the wildlife dependent upon them, while addressing coastal squeeze, climate change and dynamic coastal processes.	↘ **	↔ ***	↔ *	n/a	↔ ***	↑ ***	↗ **	↔ **	↔ **	↗ ***	↗ **	n/a	↑ ***	↑ ***	↗ ***	↑ ***	↗ **	↑ ***	↑ ***
SEO 2: Encourage a strategic approach to the planning of land uses around the estuary to address the pressures of climate change and development, ensuring that natural processes continue to function, the estuary's biodiversity value is protected and enhanced, and its open and expansive character is retained.	↘ **	↔ ***	↘ **	n/a	↔ **	↗ **	↔ **	↔ **	↔ **	↔ **	↗ **	n/a	↔ **	↗ ***	↔ ***	↑ ***	↔ **	↑ ***	↔ **
SEO 3: Work with land owners and managers to incorporate more habitats and features into the farmed landscapes that improve biodiversity, address water quality and availability and contribute to landscape character.	↑ ***	↔ ***	↑ *	n/a	↔ ***	↑ **	↑ ***	↔ **	↑ ***	↗ ***	↑ ***	n/a	n/a	↗ **	↔ **	↔ **	↔ ***	↗ ***	↔ **
SEO 4: Improve green infrastructure links between urban and rural areas and seek opportunities for public enjoyment of the open, expansive landscape and its dynamic coastal features and wildlife.	↔ ***	↔ ***	↔ ***	n/a	↔ ***	↗ **	↗ **	↗ **	↔ ***	↔ **	↗ **	n/a	n/a	↗ **	↗ **	↔ **	↑ ***	↗ ***	↔ ***
SEO 5: Protect, record and manage the cultural and historic landscape associated with the history of the area as a long standing key communication and trading route.	↔ **	↔ ***	↔ **	n/a	↔ ***	↔ **	↔ ***	↔ ***	↔ ***	↔ ***	↔ **	n/a	↔ **	↑ ***	↑ ***	↔ **	↑ ***	↔ ***	↔ **

Note: Arrows shown in the table above indicate anticipated effect on service delivery ↑ = Increase ↗ = Slight Increase ↔ = No change ↘ = Slight Decrease ↓ = Decrease.
Asterisks denote confidence in projection (*low **medium***high) ° =symbol denotes where insufficient information on the likely impact is available .

Dark plum =national importance; mid plum = regional importance; light plum = local importance

Landscape attributes

Landscape attribute	Justification for selection
Expansive, open, low-lying estuarine landscape, with wide expanses of open water, big skies and long views punctuated by views of major industrial installations, prominent structures, and busy shipping route along the estuary.	■ Long and expansive views possible through absence of tree cover as well as the wide expanses of open water and sea. ■ Iconic structures include the magnificent Humber Bridge, widely visible up and down the estuary, Hull's tidal surge barrier, 'The Deep' on the water's edge at Hull, and the lighthouses and control tower on Spurn Point.
Coastal and inter-tidal habitats, which include sand dunes, salt marsh, reedbeds, mudflats, sandy shores, supporting rich wildlife and revealing the dynamic geomorphology of the estuary.	■ The estuary is designated SSSI, and is a Ramsar site; it is also a designated Special Protection Area (SPA) for the many overwintering and breeding birds that are supported, including golden plover, bar-tailed godwit, avocet, marsh and hen harriers. ■ The estuary is also a designated Special Area of Conservation (SAC) for its dynamic and changing system of accreting and eroding intertidal and sub-tidal mudflats, saltmarshes, reedbeds, fixed and mobile dunes and dune grassland, as well as supporting populations of grey seals and lampreys. ■ Spurn Point, a peninsula subject to the processes of erosion and accretion, and Far Ings are National Nature Reserves. ■ New wildlife habitats are being created as a result of compensation sites or managed realignment of the estuary, for instance as at Alkborough Flats.
Sense of remoteness along the estuary, in particular on Spurn Point.	■ Spurn Point is a designated Heritage Coast. ■ There are high levels of tranquillity on the Spurn peninsula and in rural areas on the north side and along the upper reaches of the estuary.

Landscape attribute	Justification for selection
Strong agricultural character to rural areas, with productive land under arable crops, in a large scale landscape of large fields, ditches, particularly distinctive on the north side; generally few trees.	■ 37 per cent of the land is Grade 1 and 2, and is therefore under productive cultivation, while another 30 per cent is Grade 3. ■ Settlements in the rural areas are small and scattered. ■ The relatively recent reclamation of much of the land means that there are few long established landscape features such as woodlands.
Contrasts between quiet rural areas with small scattered settlements and busy urban areas and industrial complexes.	■ Proximity of deep water has enabled the development of ports to facilitate the import and export of a wide range of goods and materials, and has given rise to oil refineries and chemical works. ■ Few settlements outside main urban areas.
Connections with history through evident lighthouses and defence structures, Hull as an important trading centre and more recently the Humber Bridge connecting opposite sides of the estuary.	■ Early archaeological evidence reveals importance of estuary for trade and communications between the North Sea and inland from the start of historic time. ■ Very fine municipal architecture dating from 19th century in the centre of Hull, reflecting its prosperity at that time. ■ Prominent 19th-century lighthouses on Spurn Point, plus a vessel traffic services tower and coastal defences. ■ 19th-century artillery battery and minefield control centre at Paull Point, First World War forts and an acoustic mirror at Kilnsea, and Second World War anti-aircraft batteries and bomb decoys.

Landscape opportunities

- Protect the open and expansive character of the landscape, with its big skies and long views, and the strong contrasts between remote, rural areas and busy urban and industrial areas.
- Allow for the continuing dynamic coastal processes, and protect the range of estuarine, coastal and wetland habitats that contribute to landscape character and support the wide range of wildlife.
- Protect and manage the historic features that reveal the links with the changing use of the area over time for communications and defence, and record any historic features that may be lost through rising sea levels.
- Manage the network of drains and ditches so that they form more effective features within the landscape, provide good quality habitat and form links between wetlands and other semi-natural habitats.
- Maintain the agricultural landscape, taking opportunities where possible to improve its contribution to the landscape and biodiversity contained within it.
- Plan for rising sea levels through finding opportunities to pull back flood banks or construct soft defences, enabling inter-tidal habitats to develop and ensuring that they are established so that they enhance biodiversity and strengthen landscape character.
- Create habitats and landscape features such as wet grassland and reedbeds within both new and existing industrial developments and urban areas.
- Seek opportunities to improve access so that more people can enjoy the estuary with its big skies, long views, historic features and abundant wildlife.

Ecosystem service analysis

The following section shows the analysis used to determine key Ecosystem Service opportunities within the area. These opportunities have been combined with the analysis of landscape opportunities to create Statements of Environmental Opportunity.

Please note that the following analysis is based upon available data and current understanding of ecosystem services. It does not represent a comprehensive local assessment. Quality and quantity of data for each service is variable locally and many of the services listed are not yet fully researched or understood. Therefore analysis and opportunities may change upon publication of further evidence and better understanding of the inter-relationship between services at a local level.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	High quality agricultural land Estuary waters	This is productive agricultural land, with 1 per cent Grade 1, 36 per cent Grade 2 and 30 per cent Grade 3. Commercial fishing and small scale wildfowling and angling are important.	Regional	Agriculture is mainly based around large farms producing cereals, oilseeds and other arable crops, (over 77 per cent of the farmed area), with just 16 per cent put down to grass or uncropped. Livestock rearing is focussed on pigs. Expansion of food production could put further pressure on limited water availability, as well as on soil quality, with the risk of increasing the possibility of saline intrusion into groundwater. Introduction of crops such as maize could impact on the use of land by estuary birds for roosting, feeding and loafing. The estuary supports significant commercial fisheries, while small scale wildfowling and angling are well established activities.	Ensure that soils are managed to enable continued agricultural production. Select crops that have reduced requirement for irrigation. Address demand for water through providing more on-farm water storage. Address water quality and protection of estuarine habitats and processes to ensure continued populations of fish.	**Food provision** **Water availability** **Regulating water quality** **Regulating soil quality**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Woodland cover	Insignificant existing woodland (1.6 per cent of area).	Local	Woodland cover is sparse and confined to small woodlands and plantations.		**Timber provision**
Water availability	Chalk aquifer Groundwater Rivers	The NCA overlays a major chalk aquifer, which is important for an extensive area beyond the NCA as it supplies a large proportion of water for public supply and farming needs.[5] On the north of the Humber, groundwater sources have 'no water available' (around Hull) or are 'over licensed' (around Brough).	Regional	Water from the River Hull is generally not useable for licensed purposes due to saline intrusion.[6] Abstraction licenses on the north side are restricted to ensure that groundwater flow into the Humber is maintained for as long as possible to reduce saline intrusion when groundwater levels are low. On the south shore of the Humber, groundwater sources are mostly 'over licensed', with a marginally improved status of 'no water available' around Whitton. Overall, it is judged that there is 'no risk' to surface water from abstraction or flow pressure, and 'moderate' risk to groundwater from abstraction in this NCA.[7]	Adopt land management practices that improve soil infiltration, in particular permanent grassland. Increase the extent of semi-natural habitats. Adopt cultivation practices that reduce demand for water for irrigation of crops.	**Water availability** **Regulating soil erosion** **Regulating soil quality** **Biodiversity**

[5] Environment Agency, *Humber River Basin Management Plan*, December 2009.
[6] Environment Agency, *The Hull and East Riding Catchment Abstraction Management Strategy*, March 2006.
[7] Environment Agency, *River Basin Characterisation 2*, January 2009.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biomass energy	Existing woodland Biomass crops	Insig-nificant woodland cover (1.6 per cent).	Local	The limited woodland cover offers very little potential for providing wood fuel. There is a low potential yield for short rotation coppice, with some areas of medium potential on the south shore of the Humber. There is a high potential yield for miscanthus throughout the NCA. There are potential landscape impacts from biomass plantings within the NCA, which are considered in the tables on the Natural England website[8], and also potential impacts on estuarine bird populations. There may be scope for increasing the area of biomass in relation to new developments, but the crops need to be located to avoid impacting on feeding or breeding areas for waders, or blocking key views or reducing the expansive character of the landscape. Extensive biomass crops are unlikely as much of the land is used for productive arable cropping.	There may be limited opportunities for planting biomass crops in association with new developments, but care needs to be taken to ensure that there are no adverse impacts on the biodiversity or open character of the landscape.	**Biomass energy** **Climate regulation**

[8] Natural England website, Opportunities and optimum sitings for energy crops, http://www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/o41.aspx

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Grazing marsh Reedbeds Mudflats	Extensive areas of grazing marsh close to the estuary (3 per cent of the area); also reedbeds (2 per cent) and mudflats (1 per cent).	National	The soils in this NCA generally have a low carbon content of 0 to 5 per cent reflecting the dominance of mineral soils. Some of the soils of the coastal flats may have more organic-rich topsoils that will be important to conserve. In addition, significant carbon storage will be provided by the more than 2,000 ha of grazing marsh, reedbeds, and the mud flats and marine sediments, all of which store high levels of organic matter. Some of these may be lost through sea level rise. Climate change may cause sea level rises and changes in habitats, so species will need habitat corridors and stepping stones to be able to move in response to those changes. In order to keep pace with the predicted rates of sea level rise, a large amount of extra sediment is likely to be required in the future to maintain important natural features and habitats.	Adopt cultivation practices that retain and increase the organic content of soils, such as over-wintering stubble and including fallow in rotations, and where possible increase the area of permanent grassland. Adopt cultivation practices that reduce reliance on high levels of fertiliser application. Seek opportunities to protect and expand areas of grazing marsh, reedbeds, saltmarsh and mudflats. Seek opportunities to move flood defences back to provide space for the development of new inter-tidal habitats. Ensure that realignment sites are managed to develop their full potential to support and enhance the biodiversity interest and characteristic landscape of the estuary. **Continued on next page...**	**Climate regulation** **Regulating water quality** **Regulating soil erosion** **Regulating soil quality** **Biodiversity** **Sense of place/ inspiration** **Geodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation					**... continued from previous page.** Seek opportunities to link fragmented habitats with other semi-natural habitats such as well managed ditches and grasslands, to enable species to move in response to changing sea levels and habitats. Ensure that natural processes of sediment accretion and erosion are able to continue.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	The estuary Chalk aquifer	The ecological status of surface water bodies and the ecological potential of 'heavily modified' water bodies such as canals and drains on the north shore of the Humber is generally 'moderate', and on the south shore is generally 'poor'. The chemical status of groundwater in this NCA is 'poor' and in a small part of the East Yorkshire Chalk around Hull is at risk from saline intrusion.[9] The ecological potential of the estuarine waters of the Humber, considered a 'heavily modified' water body, is 'moderate', while the chemical status of the Humber estuarine waters is 'failing to achieve good' status.[10] Current WFD assessments of the chemical quality of the water in the estuary indicate that parts of the estuary fail.	Regional	Much of the ecological and chemical status of the Humber is dependent upon waters that flow into it from upstream; this makes it vulnerable to inputs from urban and industrial areas and from agriculture. There are therefore limited possibilities for addressing the issues within this NCA. However, the issue of saline intrusion needs to be addressed by finding ways of reducing the demand for water abstraction. Within agricultural areas, measures can be taken to reduce nutrient and sediment run-off by establishing permanent grassland as a buffer along watercourses.	Establish buffers of permanent grassland along watercourses. Reduce nutrient run-off by balancing fertiliser inputs with needs. Reduce demand for water for irrigation, by selecting more drought resistant crops and / or increasing water storage capacity on farms. Manage pumped drainage of the area in such a way as to ensure that saline waters are not drawn in.	**Regulating water quality** **Regulating soil erosion** **Biodiversity** **Water availability**

[9] Environment Agency, Humber River Basin Management Plan, December 2009.
[10] Environment Agency, River Basin Management Plan, Humber River Basin District, Annex A: Current state of waters, December 2009.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Estuary Inflowing rivers	Increased storm frequency is leading to higher flood flows coming downstream into the estuary.	Local	Most measures to address river flood issues for example encouraging extension of flood storage areas, slowing the flow of watercourses through restoring natural routes, flooding of ings, planting, etc would be more effective when applied to rivers and streams upstream, especially upstream of Hull in NCA 40 Holderness.	Manage the network of ditches and drains to ensure that whilst operating effectively to drain the land, they also make a positive contribution to the landscape and to biodiversity, and act as links between other semi-natural habitats.	**Regulating water flow** **Sense of place/ inspiration** **Biodiversity** **Geodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Fertile soils	There are 5 main soil types in the NCA, the first being by far the greatest: ■ Loamy and clayey soils of coastal flats with naturally high groundwater, cover 79 per cent of the NCA. ■ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (8 per cent) . ■ Slightly acid loamy and clayey soils with impeded drainage (5 per cent). ■ Saltmarsh soils (2 per cent). ■ Freely draining lime- rich loamy soils (1 per cent).	Regional	The loamy and clayey soils of coastal flats with naturally high groundwater have high agricultural potential but much of this is dependent on the continued ability to pump drain and protect the soils from sea flooding/ saline intrusion (also locally some soils are saline and at risk of structural damage where drained). Where there is a high silt / fine sand content and / or drainage is poor, capping may occur, which can be reduced by increasing the soil organic matter content, while compaction may occur if heavy machinery is used.	In those areas with high groundwater, seek cultivation practices / crops that can cope with the conditions. Seek ways of reducing demand for water by selecting of crops and / or increasing storage of water on farms, to prevent any saline intrusion from damaging soils Adopt cultivation practices that increase organic content of soils, such as introducing fallow into rotations, over-winter stubbles, direct drill and grass leys. Avoid overstocking or using machinery where it would lead to the compaction of vulnerable soils.	**Regulating soil quality** **Regulating soil erosion** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Fertile soils	Loamy and clayey soils and slowly permeable seasonally wet slightly acid but base rich loamy and clayey soils; 87% of area. Slightly acid loamy and clayey soils with impeded drainage; 5 per cent of area. Free draining lime-rich loamy soils. The entire NCA, with the exception of a small area in the south-east at Grimsby, is part of a Defra Priority Catchment (the East Riding of Yorkshire and North Lincolnshire catchment).	Regional	While the majority of the area is not significantly prone to soil erosion, there are places where sediment run-off and compaction are to be avoided. The saltmarsh and mudflats play an important role in protecting inland soils from loss through coastal erosion and thus need to be protected. The loamy and clayey soils of coastal flats with naturally high groundwater and the slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils have a low risk of soil erosion. However, the slightly acid loamy and clayey soils with impeded drainage are prone to capping / slaking, and are easily compacted by machinery or livestock if accessed when wet, increasing the risks of soil erosion by surface water run-off. The freely draining lime-rich loamy soils are also potentially at risk of erosion where cultivated or bare soil is exposed. Priorities in this catchment include measures to reduce sedimentation in watercourses and to reduce soil damage by livestock and vehicles.[11] Inter-tidal habitats such as mudflats and saltmarsh effectively absorb the energy of waves, and thus provide a defence against erosion of soils.	Create grass buffers along ditches and watercourses to capture sediment run-off. Protect saltmarsh and other inter-tidal habitats to create a buffer between the sea and agricultural land. Manage abstraction of groundwater to prevent saline intrusion. Ensure the retention of mudflats and saltmarshes, to provide a cost effective defence against soil erosion.	**Regulating soil erosion** **Regulating soil quality** **Regulating water quality** **Biodiversity**

[11] Natural England, Capital Grant Scheme - Funding Priority Statement 2010/11, Catchment 6: East Riding of Yorkshire and North Lincolnshire, date unknown.

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Semi-natural habitats, including saltmarsh	3 per cent of the area is floodplain grazing marsh, with 2 per cent reedbeds, 1 per cent lowland meadows and 1 per cent fens.	Local	Pollinating insects are generally supported by a range of semi-natural habitats, in particular species rich grasslands. There are limited areas of semi-natural habitats especially within the inland agricultural areas.	Seek opportunities to introduce flower rich grasslands within arable areas, creating connecting links with other semi-natural habitats where possible. Protect areas of saltmarsh and other semi-natural habitats, and extend where possible.	**Pollination** **Biodiversity** **Sense of place/ inspiration**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating coastal flooding and erosion	Sea and estuary Spurn Head peninsula	The Estuary is experiencing rising sea levels, which when combined with high river flows and low atmospheric pressure can result in significant flooding. The whole NCA falls within a flood risk area, and reflecting this risk, essentially the entire estuarine shore is protected by flood defences. [12]	National	Settlements at risk of coastal flooding include Barton upon Humber, Easington and Kilnsea. [13] The approach to the management of these coastal defences on the north shore of the Humber is generally to 'hold the line', with realignment of the defences at Kilnsea. The approach at Easington is to ensure continued protection of the gas terminal from coastal erosion. No active intervention will occur in areas where the maintenance of defences will become uneconomic, whilst in some areas flood defences will be moved through managed realignment to create new intertidal habitat and also provide flood storage to help manage water levels. On the south shore of the Humber, from Immingham to Grimsby, the approach is to hold the line of existing coastal defences throughout the long term (to 2105), protecting the significant industry, port and residential areas here. [14] **Continued overleaf...**	Seek opportunities to move flood defences inland, thus ensuring that intertidal habitats can expand and respond to rising sea levels. Ensure that realignments are managed so that inter-tidal habitats can develop and expand effectively. Monitor processes affecting Spurn peninsula, and work with partners to find solutions that enable dynamic coastal processes to continue, but taking into account the need to protect access to key facilities on the peninsula. Seek opportunities to create fresh water habitats, wetland habitats, brackish water bodies to compensate for those lost through rising sea levels. **Continued overleaf...**	**Regulating coastal flooding and erosion**

[12] Environment Agency, The Humber Flood Risk Management Strategy, March 2008
[13] Environment Agency, The Humber Flood Risk Management Strategy, March 2008
[14] Humber Estuary Coastal Authorities Group, Flamborough Head to Gibraltar Point Shoreline Management Plan Non-Technical Summary, Consultation Draft, 2009

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating coastal flooding and erosion continued				However there is uncertainty about the impact of coastal processes on the future of Spurn Head. One theory is that the barrier will retreat westward, 'rolling over' toward the estuary as the coastal side erodes, and that any breaches would be self-repaired by sediment deposition. Another theory is that a breach would not be repaired, and the Humber would use a new breach channel to drain into the North Sea, causing rapid erosion and possible loss of the entire peninsula, leaving Spurn Head as an island. Current data suggests that such a breach may occur within five to ten years time (2012-2022). Tidal flooding, exacerbated by rising sea levels, and combined with high river flows and rainfall, represents a high risk, especially to Hull, as almost the whole of the city is below highest tide levels and its drainage infrastructure struggles to cope with extreme events. Due to the low levels, the city's drainage system is reliant on pumps, and if these fail or their capacity is reached, then widespread flooding can occur. At the mouth of the River Hull, the Hull Tidal Surge Barrier has been built to prevent floodwater from the Humber overtopping defences along the River Hull. [15] **Continued overleaf...**	Where existing flood defences are reinforced, work with partners to ensure that there are no adverse impacts on features of biodiversity and historic interest, and that the open character of the area, the long views and access to the shores of the estuary are maintained.	

[15] Environment Agency, *Hull and Coastal Streams Catchment Flood Management Plan, draft main stage summary document*, June 2008

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating coastal flooding and erosion continued				Along the south shore of the Humber, there are few settlements at risk from fluvial flooding. Barton-upon-Humber is at risk from a combination of localised surface water and groundwater as well as flooding from rivers and drains, and in addition to embankments, is also protected by a pumping station.[16] Spurn Head peninsula is key to the protection of the estuary, creating sheltered waters where mudflats can build up. It also provides protection against waves to areas such as Cleethorpes and Grimsby to the south of this NCA. The roll-over or breach of Spurn Head would result in significant changes in patterns of erosion and accretion within the estuary, and would expose more of the shoreline to the energy of the waves. It also has the potential for adverse impacts on the internationally designated sites in the Humber Estuary. The coastal policy approach at Spurn Head peninsula recognises that the continued repair of breaches is unsustainable in technical, economic and environmental terms. The aim is therefore to allow the peninsula to evolve naturally with as little intervention as possible, while maintaining access to the key facilities at Spurn Head. **Continued overleaf...**		

[16] Environment Agency, *Grimsby and Ancholme Catchment Flood Management Plan: Summary report*, December 2009

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating coastal flooding and erosion continued				It is possible that with the predicted rise of sea levels a large amount of extra sediment is likely to be required in the future to maintain the important natural processes and the habitats created. With rising sea levels, there will be continuing coastal squeeze, which will require the managed realignment of flood defences to enable inter-tidal habitats to shift and expand. Saltmarshes and mudflats very effectively dissipate the energy of waves, and thus their retention and expansion represents a cost effective flood defence strategy, as well as providing habitats. Managed realignment may also subsequently affect adjacent fresh and brackish water habitats, and these losses will need to be addressed.		

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration	Expansive, flat, low-lying estuarine landscape with big open skies and lack of trees Quiet rural areas Remote locations Contrasts with busy industrial areas and shipping traffic	The mix of coastal influences, busy shipping lanes, modern industrial complexes and agriculture give the area its particular character. Iconic features such as the Humber Bridge, the Deep, the lighthouse and control tower on Spurn Point all form distinctive foacal points within the area. The mudflats support internationally important populations of breeding and wintering birds, often seen feeding and flying along the shoreline, while other notable estuarine features include saltmarsh, dunes and shingle structures, particularly the distinctive landform of Spurn Head. The reclaimed marshland itself is characterised by an open landscape of drainage channels and high flood banks, supporting large rectangular arable fields and limited scattered tree cover. Spurn Point is recognised as Heritage Coast for its outstanding landscape and recreational experience.	Regional	The tidal nature of the estuary along with the weather provides an ever changing scene, dominated by either water or extensive stretches of intertidal mudflats. Of particular note are the flocks of birds, and the opportunity for birdwatching along the Spurn peninsula, which is located on key migration routes. Some remote places such as Alkborough, Goxhill and Spurn Point, can also provide inspiring experiences because of their sense of remoteness and 'wildness'.	Maintain expansive character of area, including long views and tranquil areas. Plan new developments so that long views are retained. Improve access to flood banks (where there is no adverse impact on biodiversity) so that more people can experience the distinctive estuarine landscape, with its internationally important populations of birds. Improve understanding of the many features and functions of the estuary, including its active geomorphological processes and wildlife value.	**Sense of place/ inspiration** **Sense of history** **Recreation** **Tranquillity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	Drainage history Defence features Coastal management features Vernacular architecture and villages	A sense of history is evident in the reclaimed marshland landscape, including occasional drainage dykes constructed in Roman and medieval periods, along with the extensive channels, 'warping' drains, flood protection berms and sophisticated sluice and pumping systems dating from the late 17th-century. The wetlands preserve nationally important palaeo-environmental and archaeological evidence. Other historical features that are particularly evident are those relating to defence, such as the 19th-century artillery battery at Paull Point and bombing decoys at Little Humber. Also clearly visible are the 19th- century lighthouses on Spurn Head near to the 20th-century shipping traffic control tower, and further inland the iconic Humber Bridge, built in 1981.	Local	This landscape is of particular interest due to its relatively recent history of reclamation, with land protected from the sea by high flood banks. There are a number of iconic structures which form important focal points when travelling around the NCA. But there is also historic interest in villages, along with evidence of early industrial activities. Restoration of historic features should use local materials and respect local styles.	Seek opportunities to improve understanding of the historic processes of reclamation of land and its drainage and management. Protect key features and structures, and the intertidal habitats which contain palaeo-environmental and archaeological evidence. Provide access to key historic features, including the notable defence structures, and provide interpretation to improve understanding of their functions. Ensure that the restoration of historic features and traditional buildings are carried out using local materials and respecting local styles and traditions.	**Sense of history** **Sense of place/ inspiration** **Recreation**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Remote locations such as Alkborough, Goxhill, Blacktoft, Spurn Point	This NCA has very contrasting areas. Thus Hull and the industrialised areas and ports, are far from tranquil, with the constant movement of ships, in contrast to the quieter rural areas, and the open estuary itself. 45 per cent of the area is still classified as 'undisturbed', a decline from 55 per cent since the 1960s. There are important localised areas of tranquillity associated with the mud flats and estuarine landscape to the east of the area at Sunk Island and west of Hull at the head of the estuary, as well as at Alkborough and Blacktoft. Spurn Point in particular retains 'another world' quality, all but cut off from the mainland, stretching out between the North Sea and the wide open waters of the estuary.	Regional	It is important to retain the contrasts between busy, active areas and more remote rural or 'wild' areas. This will require containment of development into busy areas, and control of intrusive elements such as lighting.	Ensure that new developments are contained within or adjacent to the existing industrial and urban areas, to retain the contrast between them and the remote rural areas. Ensure that light spill is kept to a minimum.	**Tranquillity** **Sense of place/ inspiration** **Biodiversity**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Rights of way Parks and open spaces Coast and estuary shores Open water	216 km of rights of way, at the relatively low density of 0.77 km per km2. 136 parks and open spaces within city of Hull. Spurn Point, designated Heritage Coast Angling	Regional	The estuarine landscape offers opportunities, albeit limited, for distinctive, low-key, informal recreation. Spurn Point provides very significant birdwatching opportunities of international interest, along with the open access areas of the dunes, beaches and saltmarshes. The waters of the estuary and the coast provide angling opportunities. The Deep aquarium at Hull provides a good venue for understanding the estuary, its processes and its wildlife. Hull has a reasonable number of open spaces and country parks. The quality of these green spaces could be improved particularly in areas with high levels of deprivation.	Ensure that green spaces are incorporated into new developments in and around existing urban areas. Seek ways of linking urban green spaces with rights of way and creating circular routes, thus improving access out from urban areas, especially Hull, into the countryside. Provide access to the flood banks along the estuary, where this will not disturb key bird populations, so that people can benefit from long views out over the water. Maintain fishing stock by protecting estuarine habitats, and maintaining access to coast and estuary for angling.	**Recreation** **Climate regulation**
Biodiversity	Ramsar site 37,988 ha SPA 37,630 ha SAC 36,657 ha NNR 255 ha	The estuary comprises a dynamic and changing system of accreting and eroding intertidal and subtidal mudflats, sandflats and other estuarine features, and is a designated Ramsar site, Special Area of Conservation and SSSI. It is internationally important for river and sea lamprey, and for its colonies of grey seals.	International	The coastal squeeze that affects the inter-tidal habitats is clearly a priority, to ensure that they retain their functions including supporting a wide range of wildlife, in the face of rising sea levels and increase in storm events. Also there is a need to create new fresh and brackish water habitats to replace those lost through realignments in response to rising sea levels. **Continued overleaf...**	Seek opportunities to move flood defences inland to provide more space for inter-tidal habitats to develop and move in response to sea level rises. Seek opportunities to create fresh and brackish water habitats to replace any lost through rising sea levels, and ensure that they provide connecting links between the estuary and inland areas. **Continued overleaf...**	**Biodiversity** **Regulating soil erosion** **Regulating water quality** **Climate regulation**

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity continued		The estuary is also a designated Special Protection Area for the range of over-wintering and breeding birds that it attracts, including large numbers of golden plover, bar-tailed godwit, ruff, avocet, bittern, little tern, marsh and hen harriers. It also attracts a large number and variety of non-breeding water birds. Spurn Point and Far Ings, a complex of open water and reedbeds on the south side of the estuary, are both National Nature Reserves. Drainage ditches, especially along the south side of the estuary, are particularly important for the populations of water voles that they support.		There is a legal requirement to find adequate compensation and mitigation sites as a response to any new development on the estuary that may impact on the biodiversity interest. In addition to the estuarine habitats, areas of land landward of the flood defences also play a vital role in providing feeding and shelter for the important populations of birds.	Ensure that land used by bird populations for foraging and roosting, outside the designated areas, are adequately protected and managed. Ensure that the estuarine habitats are protected and supported by corridors and stepping stones in surrounding land. Ensure that the network of ditches is well managed so that they provide suitable habitats for water voles, otters and other wildlife. Seek opportunities to buffer and expand existing semi-natural habitats, to link them with grassland strips and create connecting networks to enable species movements. Ensure that new developments adequately incorporate features to make a positive contribution to biodiversity, creating a 'permeable' landscape where possible, allowing for species movement. Support the strategic approach to assimilating new industrial development, in particular on the south bank, to ensure co-ordination of changes so that the internationally significant biodiversity is protected and enhanced.	

Service	Assets/ attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Geomorphological processes Geological exposures Spurn peninsula	There is a constantly changing and dynamic system of accretion and erosion along the coastline, creating intertidal and subtidal mudflats, sandflats, saltmarsh, reedbeds within the estuary, and changing deposits and erosion of sand and sand dunes along the North Sea coast. Spurn is an outstanding example of a dynamic spit system, very unusual, if not unique in Europe, in that the massive supply of sediment from the North Sea and from erosion of the Holderness coast to the north has enabled it to extend across the mouth of a macro-tidal estuary. There exists an exceptionally long historical map record and written accounts extending back to the 7th- century. A short stretch of cliff and foreshore at South Ferriby reveals exposures of Pleistocene glacial and post-glacial sediments – a complex mix of till (boulder clays) interbedded with silts and gravels. Resting on these are sandy chalk gravels of probable fluvio-glacial origin.	International	The interest of this area relates to its very active geomorphological processes. The historic records for Spurn Peninsula indicate that the spit continuously shifts its location in response to dynamic coastal processes, especially the ongoing erosion of the Holderness coast. The succession of sediments exposed at the cliffs is central to understanding the glacial and post glacial history of the area, including the development of Lake Humber and the effects of peri-glacial environments.	Continue to research, monitor and record geomorphological processes, to improve our understanding of them and to inform management decisions. Protect the natural dynamic processes that affect both the estuary and coastline. Provide access to sites of geological interest, in particular to the cliffs, where appropriate, and interpret the geological features, to improve understanding and enjoyment. Provide interpretation of the dynamic processes underway in the estuary and along the coast, to improve understanding and enjoyment.	**Geodiversity** **Sense of place/ inspiration**

Photo credits

Front cover: The wide open waters of the Humber estuary dominate this area, with the busy shipping lines and flocks of birds feeding on the mudflats © Paul Glendell/Natural England

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Catalogue Code: NE344
ISBN 978-1-78367-144-1

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