Outstrays to Skeffling Managed Realignment Scheme

Environmental Statement: Non-Technical Summary

Pre-Planning consultation draft 14th December 2018

We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; we make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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Quality Assurance

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Author	Jacobs

Approvals

Name	Signature	Title [complete using 497-10 as guidance]	Date	Version
Damien Keneghan	DK	Draft for pre-planning consultation	13.12.2018	2.0

EIA Quality Mark

This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by the Institute of Environmental Management and Assessment (IEMA), through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

EIA Management

EIA Team Capabilities

EIA Regulatory Compliance

EIA Context & Influence

Glossary

Abbreviation/Term	Definition
ABP	Associated British Ports
CEMP	Construction Environmental Management Plan
CTMP	Construction Traffic Management Plan
EAP	Environmental Action Plan
EIA	Environmental Impact Assessment
ES	Environmental Statement
FRM	Flood Risk Management
FRMS	Flood Risk Management Strategy
IDB	Internal Drainage Board
LWS	Local Wildlife Site
MRS	Managed Realignment Scheme
PROW	Public Right of Way
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
ZVI	Zone of Visual Interest
Principal Aquifer	An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials, which can contain or transmit groundwater.
Coastal squeeze	Coastal squeeze is intertidal habitat loss which arises due to the high-water mark being fixed by a defence and the low water mark migrating landwards in response to sea level rise.
Estuarine Habitat	Estuarine habitats occur where fresh water from rivers and streams mixes with salty sea water
Estuary Tidal Modelling	This modelling determines how the scheme behaves when the tide moves from high tide and low tide and what habitats (e.g. saltmarsh of mudflat) will form within the site
European Site	A European Site is an area designated as an international site of ecological importance, for example a SAC or SPA.
Flood Defence Level	The chosen height for flood defences in order to protect land behind from flooding
Glacial till	Till or glacial till is unsorted glacial sediment. Till is derived from the erosion and entrainment of material by the moving ice of a glacier. It is deposited some distance down-ice to form terminal, lateral, medial and ground rocks or sediments.
Glaciofluvial deposits	Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.
Heavy Goods Vehicle	A large, heavy motor vehicle used for transporting cargo
Hydrodynamic Environment	In this assessment the hydrodynamic environment refers to aspects of the water environment such as speed and volume of flows, sediment regimes.
Hydrodynamic modelling	Hydrodynamic modelling forms the basis for many other modelling studies, whether sediment transport, morphology, waves, water quality and/or ecological changes are being investigated. Research is being carried out to improve the representation of tides, waves, currents, and surge in coastal waters.
Intertidal habitats	The intertidal zone, in marine aquatic environments is the area of the foreshore and seabed that is exposed to the air at low tide and submerged at high tide. Therefore, it is the area between tide marks.
Made Ground	Ground significantly modified by human activity, usually relating to previous industrial uses.
Ramsar	A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975.
Regulated Tidal Exchange	Installing structures such as sluices, gates or pipes in a fixed defence to allow seawater to flow into an area behind the defence in a regulated, controlled way.

1. Introduction

Together with Associated British Ports (ABP), we are proposing a managed realignment scheme on the north bank of the Humber Estuary, within the East Riding of Yorkshire, in order to create intertidal habitat and improve protection from tidal flooding to the local area in line with future sea level rise predictions. Managed realignment involves building a new line of defences further back from the edge of a river, estuary or coastline and either leaving the existing defences to deteriorate or removing sections of them to allow the land in between to flood (see Plate 1 for an example).

Plate 1: Paull Holme Strays Managed Realignment breach

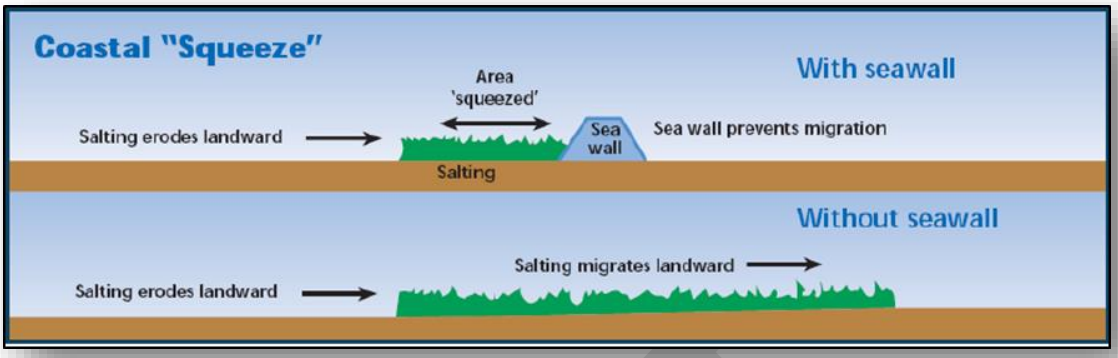
The Environment Agency's main objective for the Outstrays to Skeffling Managed Realignment Scheme (the Scheme) is to compensate for intertidal habitats likely to be lost in the Humber Estuary as a result of carrying out the Humber Strategy, due to coastal squeeze and construction works. ABP's objective is to create new intertidal habitat to compensate for future anticipated habitat losses at their port complexes due to coastal squeeze and construction works. The intertidal habitats created are required to be similar to those lost. We are working in partnership with ABP to deliver this habitat compensation and creation scheme.

The Humber Estuary is one of the largest and most dynamic estuaries in the UK. It has sea defences along almost its entire length, which protect approximately 115,000 ha of low-lying land and 400,000 people from flooding. The estuary is a designated Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and Site of Special Scientific Interest (SSSI) due to its important habitats and wildlife. This makes it a 'European Site'. The estuary is also important for industry and trade, and is home to the country's largest port complex. The Humber Flood Risk Management Strategy (2008) (the "Humber Strategy") sets the direction for managing the Humber Estuary's flood defences to protect people, property and agricultural land from flooding.

Under 'natural' conditions, without tidal or flood defences in place, intertidal habitats (such as saltmarsh and mudflats) move inland in response to sea level rise caused by climate change. However, where this movement is prevented by existing defences

(such as embankments and walls), intertidal habitats reduce in area, in a process known as coastal "squeeze" (see Plate 2).

Plate 2: The concept of coastal squeeze



Under European and UK legislation[1], we are required to maintain the total area of designated intertidal habitat within European Sites. We therefore need to compensate for the loss of these habitats due to coastal "squeeze" by providing replacement habitat or removing 'hard' flood defences so that natural habitat movement can continue. We also need to compensate for the designated intertidal habitat lost through other actions such as encroachment onto these habitats during construction.

The Scheme requires a statutory Environmental Impact Assessment (EIA) to be carried out under the Town and Country Planning (EIA) Regulations 2017 and the Marine Works (EIA) Regulations 2017. We have prepared an Environmental Statement (ES) to document the EIA process and report the likely environmental effects associated with the Scheme. This will be submitted with the planning applications to East Riding of Yorkshire Council (ERYC) and with the Marine Licence applications to the Marine Management Organisation (MMO).

This Non-Technical Summary provides an overview of the ES.

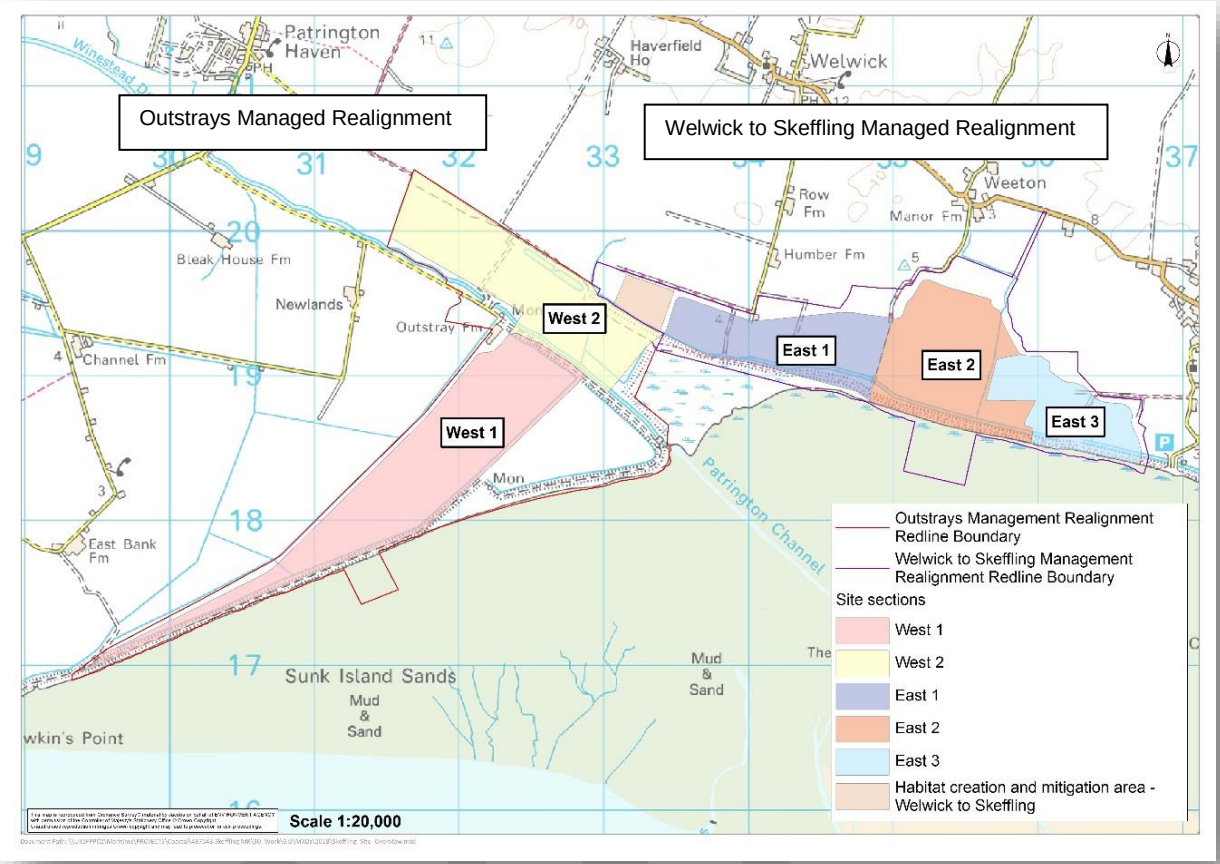
2. Site Location

The proposed Scheme is on the north bank of the Humber Estuary, south of Patrington and 20 miles east of Hull. The Scheme is presented as two sites, which are divided into several areas (see Plate 3):

- Outstrays Managed Realignment (western site), made up of West 1 and West 2; and
- Welwick to Skeffling Managed Realignment (eastern site), made up of a habitat creation and mitigation area, East 1, East 2 and East 3.

[1] European: Habitats Directive (92/43/EEC) and Wild Birds Directive (2009/147/EC). UK: Conservation of Habitats and Species Regulations 2017.

Plate 3: Site location sections



3. Flood Risk

The area is currently protected from tidal flooding by approximately 9.5 km of earth embankment flood defences, of which approximately 6 km are within the Outstrays site boundary and approximately 3.5 km are within the Welwick to Skeffling site boundary.

On 5th December 2013, a serious tidal surge moved across along the UK coastline. A deep low pressure weather system raised water levels and combined with strong winds and high spring astronomical tides to cause a tidal surge. Widespread flooding was experienced by a number of coastal communities, but the most serious impact was felt along England's east coast between the Humber and the Wash. A section of defence south of Welwick breached, causing agricultural land behind to flood. In total, approximately 7,000 ha land was flooded adjacent to the Humber Estuary

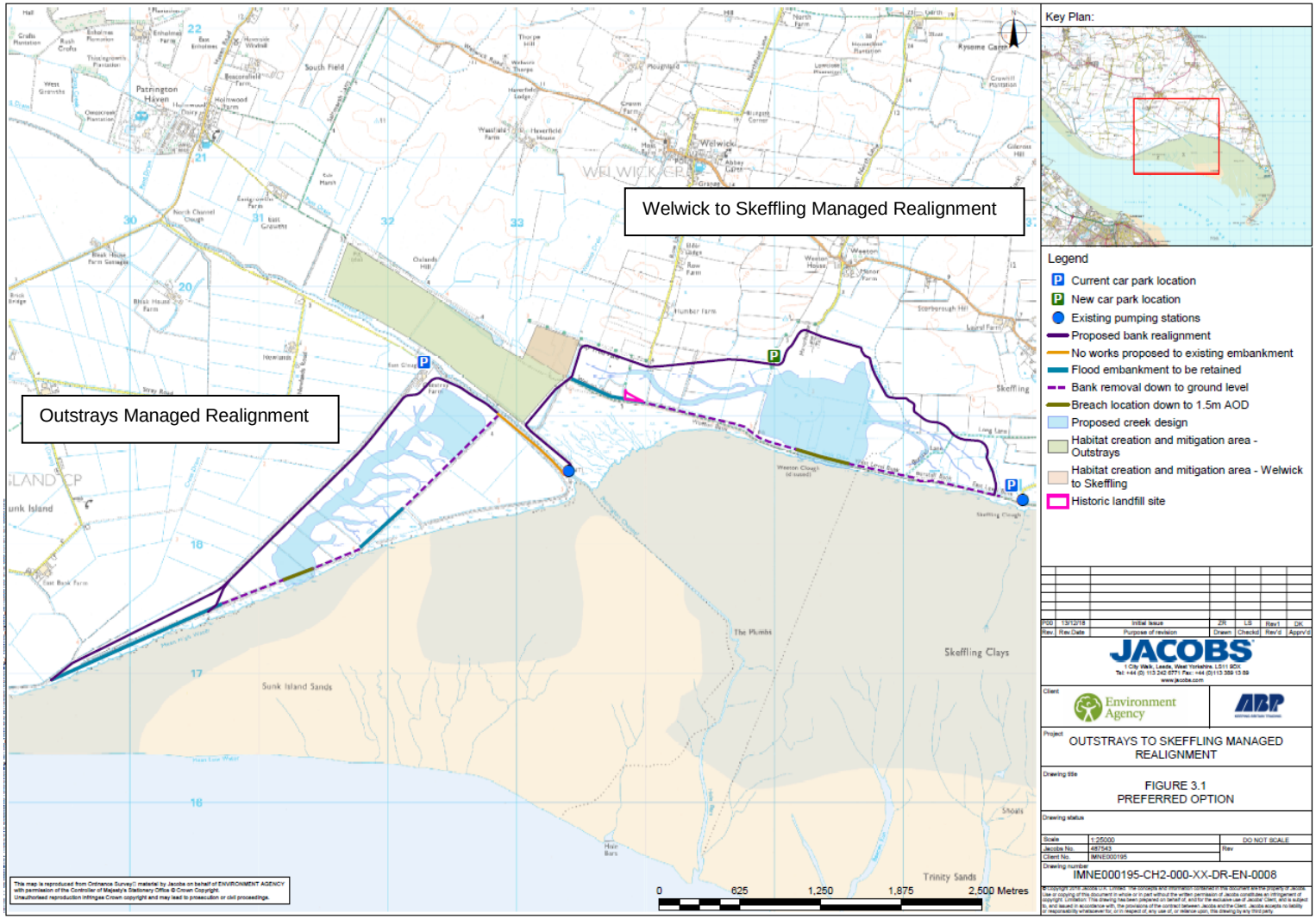
4. The Proposed Scheme

In summary, the proposed managed realignment Scheme is to create two sites of intertidal habitat (approx. 116 ha at the western site and 175 at the eastern site) through the removal/lowering of existing flood embankments. Approx. 9 km of new flood embankment will be constructed and 1 km of existing flood embankments will be raised/strengthened. Associated works will include new drainage ditches and the landscaping of a former landfill site.

Further habitat creation and mitigation works will be completed on an additional approx. 75 ha, and approx. 10 km of new bridleway/permissive path and various amenity features will be provided.

The main features of the proposed Scheme are shown in Plate 4 and described below for the two sites.

Plate 4: The Proposed Scheme



4.1 Outstrays Managed Realignment

Flood Defence Works

At the western site, an earth embankment approximately 4.5 km long and 3.5m above the existing ground level will be constructed along the back of West 1 and connect to the existing flood embankments at each end. The new flood embankment will be wider than the existing embankment, to make it more robust.

The defences at Winestead Outstrays pumping station will be raised and piling works will take place to protect the pumping station and maintain the Flood Defence Level (bring it up to the same height as the rest of the embankment) across the site. The embankment from the pumping station along the eastern side of Winestead Drain will be improved and a new embankment will be built along the southern edge of West 2. At the eastern end of West 2, piling will take place to maintain the Flood Defence Level and protect the SSSI in the Haverfield Quarry area.

Once the new flood defences have been constructed, a 250m section of the existing embankment and fronting saltmarsh will be removed (breached) to allow water to enter the site to create approx.116 ha of intertidal habitat. The existing embankment on either side of this breach will be lowered down to ground level. A section of the embankment will be retained for ecological purposes.

Habitat Creation in West 2

Scrub removal, landscaping, excavation, drainage works and planting will take place in the West 2 site to create new habitats and provide ecological mitigation. This will produce an area of freshwater wet grassland, an expanded and restored area of fixed dune grassland, and terrestrial grassland communities. This will provide habitat for wildlife and will support the adjacent internationally, nationally and locally designated nature conservation sites.

Plate 5: The West 2 habitat creation and mitigation site, looking southeast towards the estuary

Associated works

A french drain will be created behind the new embankment.

4.2 Welwick to Skeffling Managed Realignment

Flood Defence Works

At the eastern site, an earth embankment appoximately 4.5 km long and 2.5-3.5m above existing ground level will be constructed along the back of East 1, 2 and 3. The new flood embankment will be wider than the existing embankment to make it more robust.

Once the new flood defences have been constructed, a 400m section of the existing embankment and fronting saltmarsh in East 2 will be removed to allow water to enter the site to create approx. 175 ha of intertidal habitat. The existing embankment on either side of the breach location will be lowered down to ground level. A section of existing embankment will be retained at the western end for ecological purposes.

Plate 6: The existing embankment which will be breached and lowered, looking northwest from the edge of East 3 towards East 1

Habitat creation

Excavation, landscaping, planting and drainage works will be carried out to the east of East 1 to create new habitat and provide ecological mitigation. This will include different grassland communities and ponds, and will support the adjacent designated nature conservation sites.

Associated works

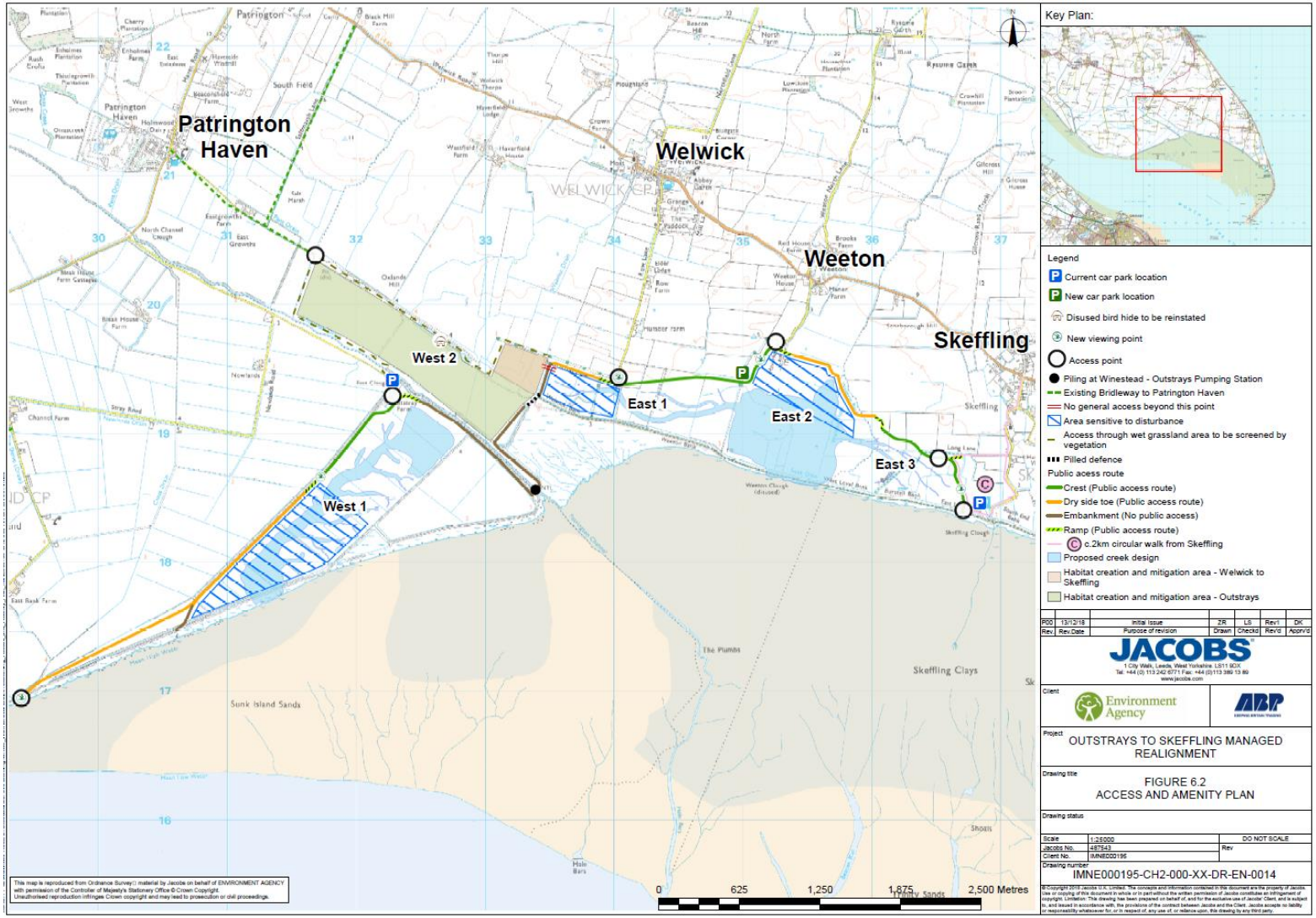
The following works will also take place:

- New drainage ditch behind the new embankment, eventually draining to Skeffling pumping station; and
- Welwick Bank former landfill will be landscaped and any contaminated material from the track that leads to it will be managed to reduce the risk to human health and pollution of the environment.

4.3 Access and amenities (both sites)

The western site will have a permissive access route along the boundary of West 1 and the majority of West 2, and a designated Bridleway along the eastern side of West 2. The eastern site will have a designated Bridleway along the boundary of the habitat creation and mitigation area, East 1, East 2 and East 3. This new Bridleway in the eastern site will replace the existing footpaths that will be lost when the Scheme is built. The proposed access routes and amenities for the Scheme (both sites) are shown in Plate 7 below.

Plate 7: Proposed Access and Amenities



The access and amenity proposals for the Scheme have been developed through long-term engagement with the local community, and organisations such as Natural England, the RSPB and the British Horseriding Society (see section 6). Where possible, the path will be located on top of the new flood embankments but in areas where birds are sensitive to disturbance, the path will be located on the bottom of it, on the landward side.

5. Alternatives considered

5.1 Site selection

The Scheme has been developed in line with the Humber Strategy, the key document on flood risk management in the Humber Estuary, which involved a rigorous process to identify suitable sites around the whole estuary for managed realignment schemes. It identified Outstrays and the Welwick to Skeffling sites as potential managed realignment sites. As ABP own land in the Skeffling area and also need to create intertidal habitat, we have joined in partnership with them to develop this Scheme.

5.2 Alterntatives and design development

Various design options have been considered for the Scheme. Table 1 sets out the approach and decisions taken.

Table 1: outline of design alternatives

Do Nothing	The 'Do Nothing' option increases flood risk and does not support the strategic (Humber FRMS, 2011) or the project specific objectives. It was rejected.
Do minimum	No improvement works could take place, only maintenance of the existing defences. This option would provide some improvement from the 'Do Nothing' option but its performance would decline over time due to climate change. The 'Do Minimum' option (along with other options with a "Hold The Line" approach i.e. retaining the current alignment of flood defences) would be difficult to fund in the Outstrays to Skeffling area under current funding rules, as there are only a small number of houses at risk and few other assets in the vicinity. This option would not provide the legally required compensatory habitat required by both the Environment Agency and ABP. It was rejected.
Do something Welwick to Skeffling managed realignment	Modelling of the likely flooding of the Welwick to Skeffling site (considered on its own because of the land available at the time) was carried out to compare breaching and lowering the existing embankments with creating a Regulated Tidal Exchange (RTE[2]). The modelling found that the breaching and lowering option would result in a larger area of intertidal habitat being created and would be more successful in meeting the desired habitat creation objectives than the RTE option, so this was taken forward.
Do Something Outstrays to Skeffling Managed Realignment	As a result of further land becoming available for habitat creation, detailed modelling and assessment of different managed realignment scenarios was carried out for Outstrays to Skeffling (combined western and eastern sites) to identify the preferred option. The options were assessed against many different criteria, including economic and environmental criteria relating to potential impacts on designated sites, archaeology, public access to the site, landscape and views. The preferred option, which is described above in section 4, was chosen as it met the Scheme objectives when considering environmental, technical, and other aspects, and value for money. The design was then refined, including through dialogue with local residents, statutory stakeholders and interest groups.

[2] **RTE involves installing structures such as sluices, gates or pipes in a fixed defence to allow seawater to flow into an area behind the defence in a regulated, controlled way.**

6. Consultation to date

We have engaged with the local community and various organisations throughout the development of the Scheme, and have taken information, suggestions and concerns raised into account in our design. Consultation activities since May 2015 have included:

- Letters to the local community and key organisations describing the Scheme and requesting feedback;
- Regular newsletters to keep the local community and key organisations up-to-date with Scheme activities and public events;
- Public drop-in events and surgery sessions in the local area to discuss the Scheme with the local community and key organisations, to present designs and updates of the Scheme's progress and receive feedback;
- A site visit to Alkborough for members of the local community and key organisations to improve their understanding of managed realignment;
- Workshops with the local community and key organisations to discuss the design and the Alkborough site visit; and

Consultation activities will continue throughout the construction period to update the public and key organisations on the progress of the Scheme and address concerns.

Plate 8: Outstrays to Skeffling Public Drop-in May 2018 (left) and June 2015 (right)

7. Construction and Operation

7.1 The Construction Programme

Both sites will be constructed at the same time over a three-year period. Works will be carried out between April and the end of September each year, to reduce impacts on over-wintering birds in the Humber Estuary. From October to March each year a small number of staff are likely to be on site for security reasons and to carry out vegetation clearance that cannot be done in the spring or summer. Table 2 shows an indicative construction timeline.

Table 2: Indicative Construction Timeline

	2018				2019				2020						2021					
Activity	Aug	S	O	N	July	A	S	O	Apr	M	J	J	A	S	Apr	M	J	J	A	S
Ground investigations																				
Ecology surveys																				
Archaeology investigations																				
Set up sites																				
Dig creeks																				
Build new embankments																				
Build West 2 habitat creation area																				
Remediate landfill																				
Beach existing embankments and remove fronting saltmarsh																				
Remove existing embankment sections																				
Notes: No Earth works will take place during over wintering bird period.																				

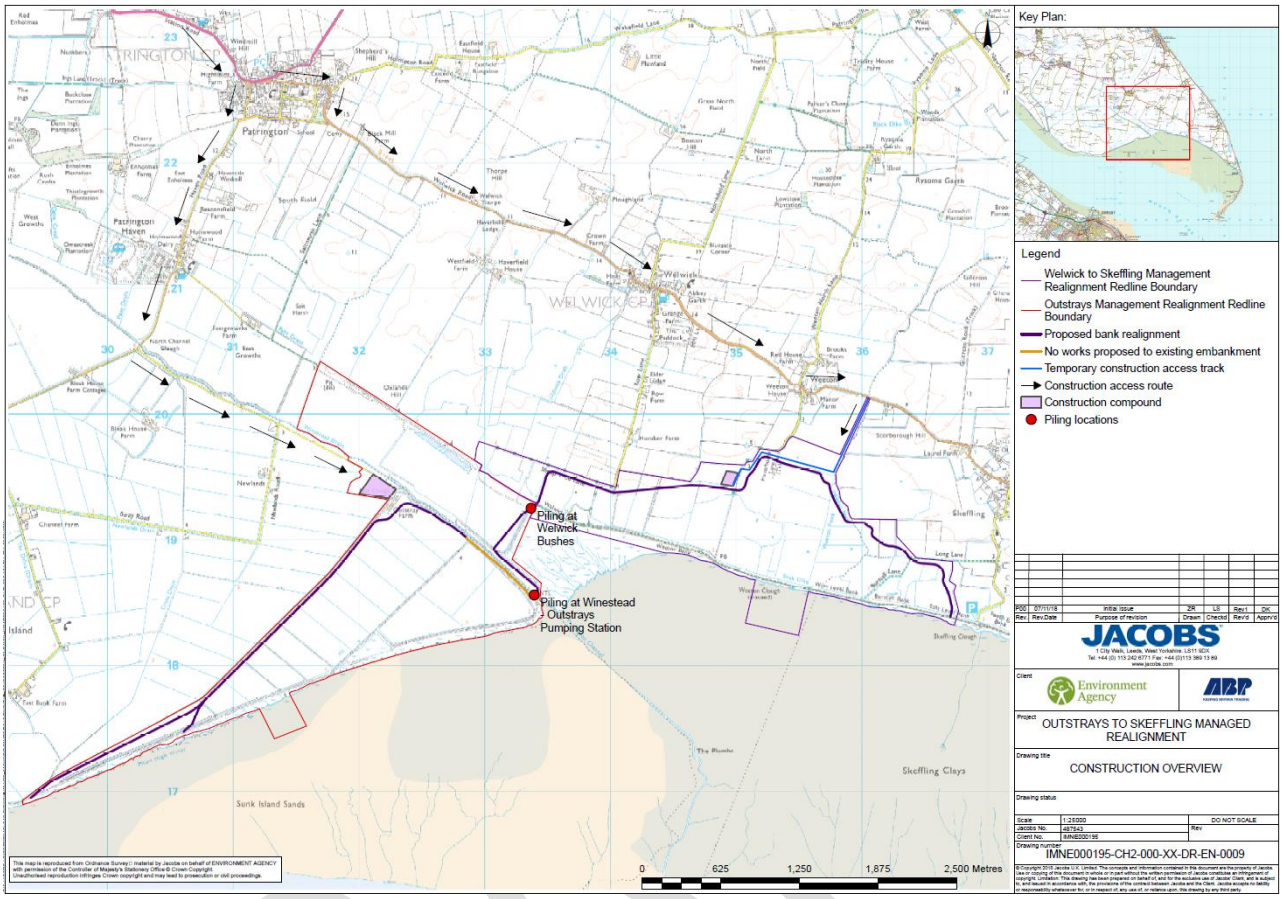
Work is likely to be carried out during daytime working hours (7:00-19:00, Mon-Fri). Any work on a Saturday would be undertaken from 7:00-13:00 and would be agreed with ERYC.

7.2 Construction Compounds and Access Routes

Two construction compounds will be set up, one on the western side and one on the eastern side. These will be used for material and machinery storage and for staff facilities/welfare throughout the construction period. There will be two compounds, one will be next to Outstrays Farm at the western site, and the other compound will be located south of Weeton at the eastern site. Construction machinery and staff vehicles will use Outstrays Road to access the main compound, and a purpose-built temporary access track leading from the B1445 east of Weeton to access the satellite compound.

Temporary tracks and bridges (across drains) will be installed across the land to allow machinery to access all areas. Plate 9 below shows the location of the construction compounds and the access routes to the site.

Plate 9: Proposed locations of the two construction compounds and access routes



The temporary access tracks and construction compounds will be removed once construction is complete. Access routes and the site work areas will be surveyed before and after construction, and, if necessary, works will be carried out to restore areas outside of the final Scheme to their original condition.

Plate 10 below shows an example of the construction works that will take place.

Plate 10: Example of construction machinery to build new flood embankments

7.3 Site operation, management and maintenance

The Environment Agency and ABP will have overall responsibility for the management of the site once construction is completed. However, we are looking for opportunities to work with other organisations to manage certain aspects of the site, such as drains, areas of new habitat and new visitor facilities (e.g. new car park and bird hides/viewing platforms).

Maintenance and inspection requirements for the new flood embankments will be determined in line with Environment Agency standards.

In the future, works may need to be carried out in East 2 in order to maintain the new intertidal habitat. The method and the frequency of this work is not yet known, and will depend on ABP's final compensation objectives, and what type habitat they need to provide (as East 2 is compensating for habitat losses from ABP activities). If required, works would be likely to involve machinery accessing the site via a ramp over the new embankment from the new car park south of Weeton, and lowering the levels of the intertidal area to maintain the habitat as mudflat. The works would be subject to further licencing applications and consents, and an environmental assessment would be carried out to support these applications.

8. Environmental Impact Assessment

EIA involves assessing the likely significant environmental effects of a proposed development and identifying ways of avoiding, reducing or offsetting any adverse effects. It feeds into the design of the Scheme and aims to ensure the likely environmental effects are properly understood during the granting of consents. EIA is also a way of ensuring that planning decisions are made with full engagement of statutory bodies, local and national groups and members of the public.

The following sections of this NTS outline the conclusions of the assessments undertaken.

8.1 Socio-Economics and Land Use

The immediate study area includes the settlements of Patrington, Patrington Haven, Weeton, Welwick, Skeffling and surrounding agricultural land. At the time of the 2011 Census, this area was home to almost 6,000 people.

Yorkshire and the Humber is one of the UK's most important agricultural regions. Most of the immediate study area is farmed, mainly for crops (such as oilseed rape and cereals) but with some sheep grazing land. The land being used for managed realignment has been bought through negotiation by the Environment Agency and ABP and is currently being tenanted by local arable farmers until construction of the Scheme begins. The Scheme will result in the loss of agricultural land when the existing flood defences are breached and the land between the existing and new flood defences turns into intertidal habitat or new habitat in West 2. However, the tourism industry may benefit as the attractiveness of the site to visitors may increase due to new facilities and larger areas for walking and wildlife watching.

It is estimated that approximately 150 construction jobs will be created as a direct result of the Scheme. Around 60 jobs could also be created in the wider economy, due to the need for material and machinery suppliers for construction and construction workers purchasing from local businesses.

There is potential for a small number of new jobs to be created relating to the management and maintenance of the site once it is built. By providing better flood protection, the managed realignment site could also lead to wider regeneration in the area.

By compensating for habitat losses, the Scheme will allow the Environment Agency to invest in flood risk management infrastructure elsewhere in the Humber Estuary, which could unlock further economic development. The Welwick to Skeffling Managed Realignment Scheme will also support the long-term expansion aspirations of ABP by compensating for habitat loss caused by the future expansion of port activities. This could lead to economic regeneration of the wider Humber area through the creation of new jobs.

8.2 Population and Recreation

As stated, the main population centres close to the site are Patrington, Patrington Haven, Weeton, Welwick, Skeffling. The site is currently used by the local community and visitors for walking, riding, fishing, wildfowling and wildlife watching. There are formal Public Rights of Way (PRoW) and informal or permissive access routes across the Scheme area, including a permissive route through Haverfield Quarry and a PRoW along the existing embankment in the Welwick to Skeffling Managed Realignment site. However, current access routes are fragmented, and there are currently no formal PRoW within the Outstrays Managed Realignment site.

During construction, there will be no public access within the site boundary for safety reasons. The car park at Outstrays Farm and other informal parking areas within the site will be closed. Current access routes through the site will be closed for the construction period. Diversion routes are limited, but we will investigate these further and divert the paths around the edge of the site where possible. Site and footpath closures and the timings of the works will be communicated to the local community through newsletters, public drop-ins and additional notices from the contractor. Public engagement activities will continue throughout the construction period to provide updates.

The Scheme design includes a range of access and recreational improvements, which have been developed through engagement with the local community and key organisations. These are shown in Plate 7. Access routes will be longer and better connected than current ones and a new car park will be built south of Weeton. New bird hides/viewing platforms and interpretation boards will also improve the site's facilities. This will improve amenity in the area and could benefit the well-being of visitors to the site.

The Scheme may affect human health during construction through noise, dust and traffic impacts, and potential pollution incidents leading to contamination. These impacts are discussed in the relevant topic sections below and will be controlled through mitigation measures.

The site is designed to ensure there is no increase in tidal flood risk because of the Scheme. As the embankments are new embankments, they will have a longer design life than the current embankments. They will also have a wider profile to make them more robust. The existing embankments will not be removed or breached until the new embankments are completed, so properties and people behind them will have continuous protection throughout the delivery of the Scheme.

8.3 Physical Processes and the Hydrodynamic Environment

The Humber is one of the largest estuaries in the UK. It has fast flowing currents, shifting sands and shallow waters, and the channels and banks are constantly changing.

The effects of the Scheme on the estuary have been assessed using hydrodynamic modelling. The construction of the Scheme will mainly be carried out behind the existing embankments, so will not interact with the estuary. The removal of sections of the existing embankment and the saltmarsh in front of it may loosen a very small amount of sediment, but this would be too small to affect the processes in the estuary due to the size of the estuary.

Water levels within the estuary will be unaffected by the Scheme once is it built, except at the immediate entrances (breaches) to the new managed realignments. There will be a minor change in the speed of the water flow from the Outstrays breach and from the Welwick to Skeffling breach, but this effect will reduce over time as the site reached a balance with the estuary tidal cycle. The modelling has shown that the site fills and empties with the tides and an array of different habitats will develop after construction is completed, including mudflat and saltmarsh.

8.4 Terrestrial Biodiversity

Terrestrial biodiversity consists of flora and fauna on land. Across both managed realignment sites, ecological surveys have identified that the main habitats within the site are grassland, arable fields, scrub, hedgerow, several ponds and a network of drainage ditches. The main species (some of which are protected) of interest that have been found within the site are barn owl, farmland birds, reptiles (lizard and grass snake), water vole, otter, great crested newt, other amphibians (smooth newt and common toad), bats, badger, invertebrates, freshwater fish, brown hare and roe deer.

Within the Outstrays Managed Realignment site there is also an area of woodland and populations of marsh harrier and sea aster mining bee. Within the Welwick to Skeffling Managed Realignment site, short-eared owl have also been recorded.

Before construction begins, some species (e.g. reptiles), will be captured and moved to Haverfield Quarry to prevent them from being disturbed or harmed. The construction activities around the site have been staggered to ensure that other species will be able to move themselves away from disturbances into nearby suitable habitat without having to be captured. The construction works will be programmed to avoid sensitive times of year, for example restrictions on working near to marsh harrier nests will be put in place during their breeding season.

Although there will be a net loss of scrub and woodland as a result of the Scheme, there will be a benefit to terrestrial biodiversity overall, as the creation of the Habitat compensation and mitigation area (West 2 and adjacent to East 1) will provide a variety of habitats for many different species including birds, reptiles, invertebrates, water voles, and otter. The new habitats will be managed through the Environmental Monitoring and Maintenance Plan.

Marsh harrier may experience adverse effects once the Scheme is constructed relating to disturbance from any increase in visitors to the Haverfield Quarry area. Vegetation screening will be put in place to reduce disturbance and monitoring will take place.

8.5 Marine Biodiversity

Marine biodiversity in this assessment consists of flora and fauna in the estuary. The Humber Estuary has one of the largest populations of non-breeding waterbirds in the world, alongside internationally important breeding species. The works fall within the Humber Estuary SAC, SPA, Ramsar and SSSI designated areas, protected for their importance to wildlife and habitats in the estuary.

The main habitats in the marine environment for both sites are saltmarsh, mudflats, open water and river bed. The main species of interest (some of which are protected) in the marine environment for both sites are coastal waterbirds, fish, and marine mammals such as seals and harbour porpoise.

During construction, coastal waterbirds may suffer from noise and visual disturbance. To minimise this effect, works will not take place during the winter months between October and March when there will be the highest number of birds using this area. Other programming requirements such as phasing of earthworks around the nesting season will be included in the Construction Environmental Management Plan (CEMP) to avoid disturbing these species. Fish and marine mammals are not anticipated to experience effects during construction because of the scale and duration of the works proposed.

Sections of saltmarsh habitat will be excavated and lost when the existing embankments are breached. However, overall, there will be a large gain in saltmarsh and mudflat habitats due to the creation of the intertidal areas between the existing and new embankments. This new habitat will benefit many marine species, including fish and coastal waterbirds.

Some species of fish may experience adverse effects relating to water quality once the Scheme is constructed, due to a potential change in the movement of sediments in the site area. Coastal waterbirds may be disturbed by any increase in visitors as a result of the Scheme. This will be managed through the Environmental Monitoring and Maintenance Plan, which will involve monitoring bird species across the site.

8.6 Geology, Soils and Hydrogeology

Ground investigations have been carried out to record the current conditions of the site. The site includes areas of Made Ground (ground significantly modified by human activity), different types of sediments deposited by the estuary, glaciofluvial deposits and glacial till. These materials sit on a bedrock of chalk, which is a principal aquifer. A former landfill site is located within East 1, and is currently having a negative effect on local surface water and groundwater quality.

During construction, measures to avoid contamination of soils and groundwater will be put in place and will be included in the CEMP. It is assumed that any excavated material that is found to be contaminated will be removed from site. The former landfill site will be remediated to prevent contaminants from reaching surrounding soils and water. This will involve covering the former landfill and raising the ground level to prevent contaminants from being released when the area around it becomes flooded. The sides of the former landfill will also be protected from erosion. This remediation will be beneficial for water quality and will reduce risks to human health for visitors to the site.

The Scheme with result in a permanent loss of soils and agricultural land due to the creation of intertidal habitat.

8.7 Water Environment

The main watercourse in the Outstrays Managed Realignment site is Winestead Drain (see Plate 11). There are also man-made drains and ditches across the site. Winestead Drain has had low oxygen levels in recent years, especially during the summer, which causes stress to plants and fish within the drain. The Welwick to Skeffling Managed Realignment site also contains many drainage ditches, the main ones being Soak Dyke, Weeton Beck and Weeton Fleet. There are also several ponds within each site.

Plate 11: Winestead Drain, looking upstream from Winestead-Outstrays Pumping Station

During construction, adverse effects on water quality could occur due to sediments or contaminants/oils/fuels reaching the watercourses. These effects will be reduced and controlled through measures in the CEMP, such as storing materials away from watercourses.

Water is likely to be abstracted from Winestead Drain to use for dust suppression during construction. This could reduce the amount of water in the drain, particularly during any dry years when water levels would be low. The drain will be monitored, and alternative water sources will be used if there is poor water quality or a low water level.

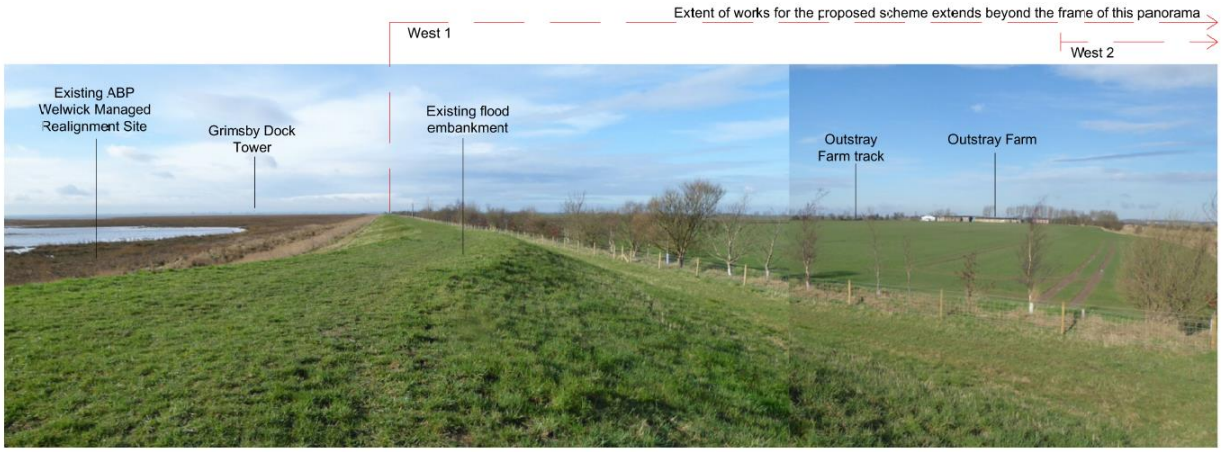
Drainage ditches and ponds within West 1 and East 1, 2 and 3 will be lost as a result of the Scheme, however, new drainage ditches will be constructed, and ponds will be created within the habitat creation and mitigation areas.

8.8 Landscape and Visual Amenity

The main landscape features of the Outstrays Managed Realignment site and surrounding area are:

- A largely reclaimed, empty landscape of large open arable fields bounded by ditches and drains;
- Small areas of woodland;
- St Patrick's Church spire in Patrington; and
- Relic sand dunes, ponds and plantation woodland in Haverfield Quarry.

Plate 1: Looking southwest along the existing embankment in West 1



The main landscape features of the Welwick to Skeffling Managed Realignment site and surrounding area are:

- A low-lying, drained arable farmland which is slightly higher than the flat landscape around the Outstrays Managed Realignment;
- Large fields with ditches, drains, hedgerows and scattered trees;
- St Patrick's Church spire in Patrington; and
- St Helen's Church tower in Skeffling.

Across both sites, the existing embankments block views of the estuary from the lower ground behind them. From the top of the embankments there are views across the estuary, where ships can be seen moving in and out.

During construction, vehicles and construction activity from the site will be visible from some locations, including footpaths, roads, some residential properties, St Helen's Church in Skeffling and ships in the estuary. Visual effects will be reduced through measures that will be included in the CEMP, including appropriate design of fencing and construction compounds, and placing restrictions on artificial lighting.

The Scheme will change the landscape of the site over time by replacing fields in West 1, East 1, East 2, and East 3 with intertidal habitat, and fields within the habitat creation and mitigation areas with a mixture of grassland, ponds and drains. Some of the trees within West 1 will also be lost. The new embankments have been designed in a way that integrates them into the landscape. Additional hedgerow planting and reinforcement of existing hedgerows will also be carried out as part of the Scheme. Overall the landscape changes are considered to be within the wider landscape character of the area and are considered to be a positive impact (new coastal and terrestrial habitats), introducing diversity in the area and improving its wildlife value. The Environmental Monitoring and Maintenance Plan will include landscape maintenance requirements.

8.9 Historic Environment

Extensive archaeological investigations have been carried out across the sites. Archaeological remains have been found within the 200m study area, several listed buildings are present and Sunk Island Conservation Area and Patrington Conservation Area are nearby. Historic landscapes are also present. The majority of archaeological features are within the Welwick to Skeffling Managed Realignment site.

Outstrays Managed Realignment

Small sections of several historic landscapes within the Outstrays Managed Realignment site will be partially removed during construction as they are located within the area that will be excavated. However, these features (fields and enclosures) will still be able to be understood in their original context. Several listed buildings will experience temporary impacts on their setting due to views of construction activity. The historic character of Sunk Island Conservation Area is not anticipated to be affected due to the distance from the site, during construction or after completion of the site. There are no other effects anticipated during the operational phase.

There is no mitigation required for any historic effects for the Outstrays Managed Realignment Site.

Welwick to Skeffling Managed Realignment

Various archaeological remains will be removed during construction as they are located within the area that will be excavated. Several types of mitigation will be carried out. This includes:

- Carrying out additional surveys;
- Recording assets before they are removed; and
- Employing an archaeologist to supervise some of the works and monitor stripping of the soil in some areas to identify and record any additional archaeological finds.

Several listed buildings will experience temporary impacts on their setting due to views of construction activity.

There are no effects anticipated during the operational phase.

8.10 Traffic and Transport

The main roads currently leading to and around the site are:

- From Patrington to the western site: Haven Road and Outstray Road; and
- From Patrington to the eastern site: the B1445, leading to minor roads including Row Lane/Sheep Trod Lane/Humber Side Lane from Welwick, Humber Side Road from Weeton, and Church Road/Long Lane/Burstall Lane/Humber Lane from Skeffling.

The construction access routes are described in Section 7.2 of this NTS and shown in Plate 8. Approximately 40 vehicles are expected to arrive on site over the course of a month for the construction phase of the earth embankments. Occasional movements to and from the site for supplies or maintenance will occur. An estimated 30 staff vehicles are likely to travel to the site each day, mostly to the main construction compound at Outstrays Farm.

There may be additional Heavy Goods Vehicle (HGV) movements to and from site if contaminated material is found, as this will need to be removed. As a worst-case estimate, this could result in up to 10 vehicles per hour arriving and departing from each site. To reduce the effects on the local highway network, these journeys would be staggered so that the western site and eastern site removal do not occur at the same time.

During construction a Construction Traffic Management Plan (CTMP) will be put in place to control traffic. This plan will consider the need to provide additional passing places on the narrower roads and resurface some roads near to the site. In addition,

the purpose-built construction access track will avoid the need to use the smaller local roads to get to the eastern site.

The local community will be kept informed about when and where plant vehicle movements will occur. The only roads that would need to be closed are the ones within the site boundary of the eastern site.

8.11 Air Quality

The current air quality surrounding the two sites is expected to be within national and EU limits due a lack of major sources of air pollution, such as industries, large urban areas and busy roads in the area. Emissions from construction vehicles are not anticipated to adversely affect nearby residents due to the low levels of existing air pollutants and the distance of residential properties from the site.

Dust will be produced by construction vehicles, excavation works and building the embankments. Best Practice Measures (BPM) and standard dust mitigation measures will be set out in the CEMP. With these measures in place, the works will not adversely affect nearby residents or ecological designated sites. This is due to the distance of the nearest residential properties from the works, and the low background levels of dust.

8.12 Noise and Vibration

The current background noise levels are low across the site and surrounding area as there is no intensive industry or busy roads. During construction, it is anticipated that any noise effects can be controlled through Best Practice Measures (BPM) and standard noise control measures (which will be listed in the CEMP), so that there will be no adverse effect on residential properties or on protected bird species. The piling would be the noisiest work; however the background noise levels and distance from nearest residential properties and sensitive fish, mammals and birds mean that impacts would be negligible.

8.13 Artificial Lighting, Litter and Vermin Control

The existing sources of artificial lighting within and surrounding the Scheme area are individual houses and headlights from cars and agricultural machinery. Artificial lighting of the site during construction is likely to be minimal as the works will take place during daytime hours. The CEMP will include measures such as directing lighting downwards and away from houses and the estuary to minimise any adverse effects.

During construction, house-keeping rules will be in place to minimise litter on the site, in the compounds and on access roads. Once the Scheme is complete, the site manager will be responsible for ensuring the site is kept tidy.

The works are not anticipated to result in any outbreaks of vermin on site during construction. However, any issues would be dealt with by an approved vermin control specialist.

9. Interaction with other projects

The EIA assessed the potential environmental effects of the proposed Scheme that could be combined with themselves and other projects' effects on the same environmental features (called cumulative or in-combination effects). There is potential for such effects to occur if contaminated material is taken off site, as nearby residents could experience traffic/access, noise and dust effects. However, with the mitigation measures listed in the previous sections in place, this would not be significant. No cumulative effects have been identified from the Scheme with other projects in the area

due to the distance of the other projects from the Scheme, which is in a rural, isolated location.

10. Environmental Management, Monitoring and Maintenance

10.1 Construction

The contractor will follow the Environmental Action Plan (EAP), which lists the mitigation measures identified during the EIA process. They will also implement standard best practice measures and follow other site-specific plans, such as the CTMP and CEMP. Monitoring of some works will be carried out by an ecologist to ensure that wildlife are not disturbed.

10.2 Monitoring and maintenance

The Scheme will be monitored after construction is completed, to ensure that it is delivering on its environmental objectives. This will be in accordance with the Environmental Maintenance and Monitoring Plan for the Scheme, and specific targets for birds that will be agreed with Natural England. This monitoring will determine the need for intervention works in East 2 in order to maintain the mudflat habitat.

The Environmental Monitoring and Maintenance plan will also include measures to maintain habitats, trees and hedges across the site.

10.3 Conclusions

The EIA identified the following significant adverse effects that would occur if no mitigation was put in place:

- Silt pollution in ponds and drains during construction;
- Change in views during construction;
- Loss of saltmarsh, fixed-dune grassland, scrub, neutral semi-improved grassland, ponds, drainage ditches and hedgerows;
- Disturbance and/or damage to several protected species including reptiles, marsh harrier and coastal waterbirds during construction;
- Spread of Non-Native Invasive Species;
- Disturbance to marsh harrier, coastal waterbirds and otter once the site is completed;
- Loss of Glacial Till as a resource; and
- Partial removal of several heritage/archaeological features.

With mitigation in place, including pollution prevention measures, careful programming of the works to avoid sensitive periods for wildlife, archaeological investigations and recording, and habitat creation, these effects are anticipated to be reduced and will not be significant. There are anticipated to be beneficial effects relating to the economy, access and amenity, habitat gain, and reduction in contamination risk.

11. Next Steps

Before the ES is submitted along with other Scheme documents as part of the planning applications and marine licence, it will be made available for comment by stakeholder organisations and the public. Some other consent applications will also be made during this period.

The provisional dates for the next stages for delivering the proposed Scheme are set out below:

- Planning application submitted: February 2019
- Planning application decision: Expected June 2019
- Construction start if application approved: July 2019
- Construction finish: September 2021

If you have any queries or would like any further information, please contact us:

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