

3. Scheme Description

3.1 Description of the works

The proposed scheme and works boundary are shown on Figure 1.2 and Figure 3.1. Frontages are shown on the Site Location Plan in Appendix 1.1, and this appendix also includes drawings of the scheme. The total Scheme length is approximately 3km. The Scheme comprises the following elements (all measurements are approximate as they depend on the existing ground level which varies):

New CEMEX embankment and demountable defences (Frontage 1):

- Construction of a new embankment (1120m long) west of CEMEX cement plant. This will vary in height between 0.9 to 3.8m above existing ground level (dry side)
- New demountable defence (indicative example shown in Photograph 3.1 below) across the A1077 with adjacent small section of new wall to tie-in with the new CEMEX embankment on the south and existing raised embankment on the north

Raising and widening the western embankment (Frontage 2):

- Raising of an existing 555m long embankment north of the CEMEX cement plant and north of the A1077. The bank will be raised by 1.14m above existing crest level, to 2.3m above existing ground level (dry side). This will result in a wider embankment width, with the dry side toe being between 6.5-9.5m wider (9.5m is where it includes a new soak dyke)
- Relocation of the existing soak dyke along the dry side of the western embankment

Demountable defence and flood walls on left bank of River Ancholme (Frontage 3):

- A second demountable defence immediately to the west of the River Ancholme
- Construction of a short length of new wall on the left bank of the River Ancholme to tie-in the new demountable defence with the existing parapet wall (Scheduled Monument) over West Drain

Demountable defences and flood walls on right bank of River Ancholme (Frontage 3):

- A third demountable defence immediately east of the River Ancholme
- Construction of a flood wall south of A1077, along the right bank of the River Ancholme, to tie-in with existing public toilets. Due to varying ground levels, the height of the wall varies, though the maximum height would be approximately 1.7m. Minor re-grading of existing ground and small embankment to divert flood water into the River Ancholme
- Construction of a new flood wall with accesses (demountable defences) between the River Ancholme (east bank), in front of the Hope and Anchor Public House and around the back of two residential properties and then to tie into a wall along the A1077 passing over East Drain. Due to varying ground levels, the height of the wall varies, though the maximum height would be 1.7m
- Demountable defences on the two accesses to the existing footbridge over East Drain
- Construction of a new flood wall to replace the existing wall along the eastern bank of East Drain between A1077 and the new embankment

Photograph 12: Example of a demountable defence (indicative only)



New eastern embankment (Frontage 4)

- Construction of a new set-back embankment, approximately 1,074m long, to the south of the existing flood defence to the east of East Drain. The embankment will be approximately 3.5m above existing ground level
- Vehicle access for maintenance along the top of the new embankment with vehicle turning places at the ends of the embankment
- New toe drains (soak dykes or filter drains) along dry side of the new embankment
- New 50m ditch parallel to Fulseas Drain for water vole mitigation
- Three accesses over new embankment to provide access by farm vehicles to fields on the north side of the embankment and for maintenance vehicles to access Fulseas Pumping Station
- Culvert and control to prevent tidal inundation where new embankment crosses Fulseas Drain
- Localised ground raising at western end of the set-back embankment to ensure drainage to Fulseas Drain

CEMEX area for planting

- An area within CEMEX will be used for tree planting to replace trees lost as part of the Scheme.

Areas/lengths

The size of the works and planning application boundary are given in Table 3.1 below.

Table 3.1: Area/lengths of works and planning application boundary

Construction Activity	Measurements
Permanent Works	7.47 ha

Construction Activity	Measurements
Temporary soil storage areas and compounds	11.02 ha
Total Red Line Planning Application Boundary	39.98 ha
Length of permanent alignment	2,951 m
Area of standalone tree planting within CEMEX	4.4 ha

Removal of temporary defences

The current temporary defences, formed of legato blocks along the west side of Fulseas Drain, will be left in place until the Scheme is completed. However, some of the legato blocks will require removal during Scheme construction to enable access.

3.2 Construction

3.2.1 Site compounds

The proposed site compounds/storage areas are shown on Figure 1.2. The sites would be used as follows:

- Site 1 and 2 – storage of materials for all embankments. CEMEX will also store material here for the embankments.
- Site 3 and 4 – storage of plant and materials for the western embankment
- Sites 5 to 6 – storage of plant and materials for the eastern embankment
- Site 7 – main site compound, with offices and plant storage

Sites 1, 2, 4, 6 and 7 would be required all year round, whereas sites 3 and 5 would only be required during works in those areas.

All sites will require topsoil stripping down to approximately 200mm, except Site 7 which is on hardstanding. Top soil will be stored locally within the working areas and used to reinstate the site compounds and also used on the banks once constructed.

Material for the embankments to be raised or constructed would initially be stockpiled at the western end of the Scheme (Sites 1 and 2). Material would then be moved to the site where it is required and stored more locally (Sites 3 to 6). A site office would be constructed at Site 7. Mechanical plant would be moved to work faces as required.

Lighting will be required for Site 7 throughout the construction period. Lighting for other sites may be required on a temporary basis as work requires. The main works over the winter will be on the flood walls and gates and therefore lighting is more likely to be required for these elements than for the embankments (though they may also require some lighting during construction).

3.2.2 Indicative construction methods

Vegetation removal

Existing vegetation, including trees, scrub and grass, will be removed from the footprint of the proposed scheme and where access is required prior to construction. In some areas vegetation clearance will be timed to minimise impact on ecology. This is described further in the Biodiversity chapter (Chapter 5).

Water vole displacement

A water vole displacement exercise will be undertaken along affected parts of Fulseas Drain where water vole are known to occur. This is described in more detail in Chapter 5 – Biodiversity.

General embankment construction

Embankment work (both raising and new banks) will be carried out in Spring/Summer/Autumn each year over two years, so as to avoid the Winter season when conditions are likely to be too wet for construction.

Existing topsoil will be removed, and the new embankments constructed, using suitable clay material. The material will be placed on site, then levelled using bulldozers and compacted using heavy duty rollers. The side slopes will be cut into shape after compaction of the material and then the topsoil will be replaced.

Works at all embankments are likely to include the use of 21-25 t excavators, dozers and rollers and being serviced by either tracked dumpers or 25 t articulated dumpers.

The level of protection for most of the Scheme is generally 6.2m above ordnance datum (AOD). It reduces down to 3.32m AOD for the embankment around CEMEX at the southern end. The embankments will initially be higher but with ground settlement the height will settle to the required level. The design level of the new defences and raised embankment does not include this settlement. The contractor will calculate the appropriate settlement at detailed design stage, which will be added to the above design levels. This is likely to be in the order of 200 mm for embankments.

CEMEX embankment

Works will take place from either side of this embankment.

Western embankment

Bank re-profiling for the estuarine side would be carried out from plant located on top of the existing embankment, with no requirement for plant to be located on the estuarine side of the existing embankment, although some access by foot would be required to the toe of the embankment. The existing soak dyke would be located further inland and the existing embankment widened and raised.

Eastern embankment

The eastern embankment will be constructed by removing the topsoil within the footprint of the new embankment and then placing suitable material to build it up. The topsoil will then be re-used to cover the new embankment.

Demountable defence

Sheet piling is likely only to be required for the western-most demountable defence. A large excavator (Movax piling rig) may be required for the piling works. The other two demountable defences are not expected to require piling.

Flood walls

Existing boundary walls will be removed and the foundations removed. New foundations and flood walls will be constructed using concrete. The walls will be cast in situ using wooden formwork, casting the base/toe first and then the walls. The walls will then be faced with an appropriate brick. Wall construction will run through the full length of the main construction period from April 2019 to the end of November 2020.

3.2.3 Temporary road closure and traffic management

The construction of the demountable defences and the works at East Drain would result in a requirement to close the A1077 for short periods of time as these elements are being constructed. The road will be closed for approximately 30 weeks altogether. This will be broken down into sections of 12 weeks, 11 weeks and 7 weeks of closure. Traffic management may be required for other elements of the construction for short periods. The Local Planning Authority has requested that the A1077 is closed and a diversion route set up during construction, rather than the use of temporary traffic management.

3.2.4 Material source and haul routes

The embankment material will come from two sources; one will be from CEMEX and will be transported to site via CEMEX's conveyor belt; the other is from another source to be determined by the contractor and is not yet known.

Material will be moved to works sites by vehicles using the A1077. Temporary access points into the various works sites (Figure 1.2) will be made and reinstated after completion of the works. The profile of import of material to site for the embankments is given in Table 3.2.

Table 3.2: Number of HGV movements during construction

Month	Max No. of HGV movements per month	Movements per day (based on 22 working days)	Movements per hour (based on deliveries restricted to 6 hours per day)	Notes
Apr 2019	1120	50.9	8.48	Advanced import of material.
May 2019	2590	117.7	19.62	HGVs to transport material to east of sluice, plus deliveries of materials to site.
Jun 2019	3030	137.7	22.95	HGVs to transport material to east of sluice, plus deliveries of materials to site.
July 2019	3030	137.7	22.95	HGVs to transport material to east of sluice, plus deliveries of materials to site.
Aug 2019	1660	75.5	12.58	HGVs to transport material to east of sluice, plus deliveries of materials to site.
Sep 2019	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Oct 2019	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Nov 2019	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Dec 2019	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Jan 2020	60	2.7	0.45	Limited HGV movements during the month as

Month	Max No. of HGV movements per month	Movements per day (based on 22 working days)	Movements per hour (based on deliveries restricted to 6 hours per day)	Notes
				outside main earth shift working window but deliveries of other materials to continue.
Feb 2020	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Mar 2020	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Apr 2020	760	34.5	5.76	HGVs to cross A1077 by CEMEX, plus deliveries of materials to site.
May 2020	1490	67.7	11.29	HGVs to cross A1077 by CEMEX, plus deliveries of materials to site.
Jun 2020	850	38.6	6.44	HGVs to cross A1077 by CEMEX, plus deliveries of materials to site.
Jul 2020	120	5.5	0.91	HGVs to bring in topsoil for west and CEMEX embankments via A1077, plus deliveries of materials to site.
Aug 2020	320	14.5	2.42	HGVs to bring in topsoil for west and CEMEX embankments via A1077, plus deliveries of materials to site.
Sep 2020	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Oct 2020	60	2.7	0.45	Limited HGV movements during the month as outside main earth shift working window but deliveries of other materials to continue.
Nov 2020	270	12.3	2.05	HGVs to move legato blocks to EA store, plus deliveries of materials to site.

3.2.5 Landscaping

Landscaping will be carried out once the works are complete (for each element). These will include re-grassing, planting trees, shrubs and hedges. Any planting of trees, shrubs and hedges will take place off the embankments to allow visual inspection of the assets.

Flood walls will be clad with brick to match the existing brickwork at appropriate locations. The Landscape and Ecology Outline Design General Arrangement Plan is Figure 6.3 (Appendix 1.1).

3.2.6 Fencing and reinstatement

Stock-proof fencing will be erected on the north side of the eastern embankment to prevent cattle entering the flood embankment and damaging the asset. Any fencing removed as part of the works will be reinstated on completion of the works.

Agricultural land and gardens affected by the works will also be reinstated on completion of the works. All reinstatement will be discussed and agreed with affected landowners. Where subsoil in fields is unavoidably compacted it will be de-compacted prior to reinstatement. The embankments will be grass-seeded.

3.2.7 Construction programme and construction workers

Enabling works, such as vegetation removal and dealing with utilities, is due to start in early 2019. Main works will start in April 2019 and will continue for approximately 21 months. Table 3.3 shows the month by month breakdown of construction and number of workers required each month.

Table 3.3: Construction program and number of workers on site

Month	No. of construction workers	Notes:
April 2019	20	Based upon 1 embankment workfaces, plus 1 wall works, plus site management.
May 2019	30	Based upon 2 embankment workfaces, plus 1 wall works, plus site management.
June 2019	35	Based upon 2 embankment workfaces, plus 2 wall works, plus site management.
July 2019	45	Based upon 3 embankment workfaces, plus 2 wall works, plus site management.
Aug 2019	40	Based upon 2 embankment workfaces, plus 3 wall works, plus site management.
Sep 2019	35	Based upon 2 embankment workfaces, plus 2 wall works, plus site management.
Oct 2019	20	Based upon 2 wall works, plus site management.
Nov 2019	15	Based upon 1 wall works, 1 bridge works plus site management.

Month	No. of construction workers	Notes:
Dec 2019	15	Based upon 1 wall works, 1 bridge works plus site management.
Jan 2020	15	Based upon 1 wall works, 1 bridge works plus site management.
Feb 2020	15	Based upon 1 wall works, 1 bridge works plus site management.
Mar 2020	25	Based upon 1 embankment workfaces, 1 wall works, 1 bridge works plus site management
Apr 2020	35	Based upon 2 embankment workfaces, plus 2 wall works, plus site management.
May 2020	30	Based upon 2 embankment workfaces, plus 1 wall works, plus site management.
June 2020	30	Based upon 2 embankment workfaces, plus 1 wall works, plus site management.
July 2020	30	Based upon 2 embankment workfaces, plus 1 wall works, plus site management.
Aug 2020	30	Based upon 2 embankment workfaces, plus 1 wall works, plus site management.
Sep 2020	30	Based upon 1 embankment workfaces, plus 1 wall works, plus site management.
Oct 2020	15	Based upon 1 wall works, plus site management.
Nov 2020	15	Based upon remaining works and demobilisation

Parking will be provided for workers near to their relevant workface. Space will be provided as part of secondary compounds located along the length of works.

3.2.8 Working hours of construction workers

Working hours for construction workers will be from 0730 to 1700 hours, Monday to Friday, with some Saturday working. We will avoid construction activities on Sundays, Public Holidays and during special events/festivals. Deliveries and certain other activities will be further restricted to avoid peak commuting times.

3.3 Operation

3.3.1 Operation of the demountable defences

The three demountable defences on the A1077 will be erected by the Environment Agency in times of high flood risk. The defences will be put into position manually and left until the flood risk has passed. The defences are likely to be required approximately once a year and there will also be a practice once a year.

During operation of the defences, the A1077 will be impassable at South Ferriby and therefore signs will be used at appropriate locations to inform road users of the road closures. A diversion route will be sign posted. The diversion route is shown on Figure 11.2 in Chapter 11.

Demountable defences to properties will also be erected by the Environment Agency at the same time as the demountable defences on the A1077.

3.3.2 Maintenance of assets

The embankments will be subject to maintenance including regular mowing and inspection. As part of the detailed design development, we will produce an Operation and Management Maintenance Manual indicating routine maintenance, monitoring and other (periodic or exceptional) maintenance activities.

3.4 Decommissioning

Decommissioning (the future removal of banks, sluice gates, lock etc.) is unlikely to be carried out unless under the proviso of a future flood risk management scheme and will not be considered further in the environmental assessment.

3.5 Uncertainties

Currently, the source of some of the material for the embankments is unknown. It is likely that approximately 50% will come from CEMEX, but the source of the other 50% is not known.

4. EIA Methodology

4.1 Scoping

A Preliminary Environmental Information Report (PEIR) was prepared in November 2017 and its aim was to present an overview of the baseline environmental information, possible opportunities and known constraints to developing the Winteringham Ings to South Ferriby Flood Alleviation Scheme, and to set the scope of the EIA.

The PEIR was used to obtain a Screening Opinion in 2017. The opinion of NLC was that the Scheme required a statutory EIA under Town and Country Planning (EIA) (England and Wales) Regulations, 2017.

A PEIR Addendum was then prepared and submitted (along with the original PEIR) to obtain a Scoping Opinion from NLC. The Scoping Opinion was received in October 2018 from NLC and has been used to scope up this ES.

The following topics were scoped in or out of the ES (Table 4.1).

Table 4.1: Topics scoped into or out of the EIA

Topic	During Construction	During Operation	Comment
Population and Human Health	Scoped in	Scoped in	Beneficial impacts on public well-being from reduction in the risk of flooding. Disruption during construction (noise, dust, vibration, access).
Biodiversity	Scoped in	Scoped in	Potential direct and indirect impacts on the Humber Estuary SPA/SAC/SSSI/ Ramsar Site. Protected species present.
Landscape	Scoped in	Scoped in	Potential for impacts on landscape and visual amenity from the new/improved flood defences. Assessment required to inform the design evolution and possible mitigation required.
Cultural Heritage	Scoped in	Scoped in	Potential impact on archaeology during construction. Potential impacts on the Scheduled Monument and its setting and the setting of Listed Buildings.
Water and Estuarine Processes	Scoped out	Scoped in	Potential impacts on water quality during construction can be managed through standard pollution prevention measures. Potential for changes in the long-term estuarine processes and geomorphology where advances/ setting back of defences will be assessed.
Land and Soils	Scoped in	Scoped in	Land take for construction and operation. Change in future land use and impact on soils through frequent inundation where setting back defences.
Material Assets – Infrastructure, Industry, Traffic and Transport	Scoped in	Scoped in	Potential disruption to A1077 and navigation during construction and road closure during operation, and potential impacts on local industry.
Air Quality	Scoped out	Scoped out	There will be minimal emissions of air pollutants during construction, with no potential for significant pollution from

Topic	During Construction	During Operation	Comment
			combustion (e.g. vehicles). Potential impacts from dust can be successfully managed through construction management measures. No emissions during operation.
Climate Change	Scoped out	Scoped out	Beneficial impacts from climate change adaptation addressed in Population. Carbon footprint considered during option assessment and will be considered as design develops and as scheme constructed.
Noise	Scoped out	Scoped out	Construction noise and vibration would be temporary and can be effectively managed through standard construction good practice. No amount of further assessment work would be required or able to further reduce impacts effectively.
Cumulative Effects	Scoped in	Scoped in	Assessment required.

4.2 Environmental Statement

4.2.1 General approach

The following procedure was used to assess and evaluate the environmental impacts of the Scheme during the detailed design stage and production of this ES.

- Identification of receptors and environmental resources likely to be affected by the implementation of the proposed Scheme.
- Overlay of the Scheme onto relevant baseline information (either by mapping or other methods). This provided a baseline against which the environmental effects of the Scheme were measured and assessed for each receptor/ resource.
- Identification of the value or sensitivity of the environmental receptors/ resource.
- Consideration of the interactions of the development with the environment, to identify the potentially significant impacts (e.g. physical change) as a consequence of the Scheme at both the construction and operational phases.
- Assessment of the magnitude of the potentially significant impacts on receptors/ resources. Magnitude includes consideration of the timing, scale, duration and nature (i.e. positive or negative) of the effect.
- Evaluation of the significance of the potential impacts on receptors/ resources based on their value/ sensitivity and the magnitude of the potential impacts.
- Consideration of the duration (temporary or permanent) of the impact.
- Where necessary, establishment of appropriate mitigation measures to reduce predicted significant impacts to an acceptable level.
- Identification of integrated design opportunities (embedded mitigation).
- Identification of the potential significant residual impacts of the mitigated Scheme.

Significance criteria were used to assess the impacts of the Scheme presented in this ES and have helped to identify appropriate mitigation where significant adverse impacts have been identified, and to identify positive environmental outcomes.

A significant effect under the meaning of the EIA Regulations is assessed in this ES to be moderate or major adverse.

Mitigation is embedded into the design of the Scheme. This has included avoiding the Humber Estuary designated sites (SAC/SPA/Ramsar/SSSI) as far as possible, including by raising embankments on the landward side rather than the estuary side. The Ferriby Sluice Scheduled Monument has also been avoided as far as possible, with only a tie in at one location. The existing large pond (Pond 29) which lies just inland of the existing embankments, has also been largely avoided. The proposed works have been planned to avoid ecologically sensitive times of year.

We expect the front bank to naturally breach by 2020 (Jacobs, 2018. Read's Island and South Ferriby Geomorphological Assessment Report). Up to this point Environment Agency may continue to mow the front bank, however any damage sustained would not be repaired. Following a breach maintenance to the front bank will cease; At this point the area between the banks would become intertidal, resulting in changes such as freshwater areas becoming saline, vegetation changes etc.

This EIA only considers and mitigates for impacts resulting from construction of the new defences and the raising of existing embankments. Any likely changes to the environmental receptors resulting from a future breach have been described in the evolution of the baseline and with reference to historic and future trends. Section 9.4.7 describes the geomorphological change to the Humber Estuary in some detail, although it is also considered by each topic.

4.2.2 Topic-specific approaches

Each technical chapter (Chapter 5-13) defines its own individual study area for assessment purposes as each study area varies. The technical chapters also define the methodology used for assigning value/sensitivity and magnitude.

5. Biodiversity

5.1 Introduction

This biodiversity chapter describes and assesses potential effects on flora and fauna as a result of the Scheme. The assessment considers all stages of the Scheme, including enabling works, the construction phase and operation phase. Where significant effects are identified, the chapter details appropriate mitigation to avoid, reduce or offset the effects. Ecological reports that should be read in combination with this EIA are listed in Table 5.1 and included as Appendix 5.1 (ecological survey reports), Appendix 5.2 (ecological mitigation reports) and Appendix 5.3 (Habitat Regulations Assessment).

5.2 Legislation and policy

In the UK many habitats and species are afforded legal protection to varying degrees through national and European legislation. In addition to legislation, advice pertaining to wildlife is given in various planning policy documents and other planning guidance. The main legislation and biodiversity policies of relevance to this EIA include:

- Wildlife and Countryside Act 1981 (as amended)
- Countryside and Rights of Way Act 2000
- Natural Environment and Rural Communities Act (NERC) 2006
- Conservation of Habitats and Species Regulations 2017
- The Hedgerow Regulations 1997
- Lincolnshire Biodiversity Action Plan (BAP) (2011 – 2020, 3rd Edition)
- UK Post-2010 Biodiversity Framework (Joint Nature Conservation Committee (JNCC) and Department for Environment Food and Rural Affairs (DEFRA, 2012) which has succeeded the UK BAP by the creation of country level strategies. In England, this is termed Biodiversity 2020: a strategy for England's wildlife and ecosystem services (DEFRA, 2011)

South Ferriby is covered by The North Lincolnshire Local Plan, which was adopted in May 2003 and is gradually being replaced by the Local Development Framework (LDF). The LDF includes a Core Strategy (Adopted June 2011), which sets out a vision for biodiversity in Chapter 11 'Environment and Resources'. The chapter states that the council will promote effective stewardship of North Lincolnshire's wildlife through:

- Safeguarding national and international protected sites for nature conservation from inappropriate development
- Appropriate consideration being given to European and nationally important habitats and species
- Maintaining and promoting a North Lincolnshire network of local wildlife sites and corridors, links and stepping stones between areas of natural green space
- Ensuring development retains, protects and enhances features of biological and geological interest and provides for the appropriate management of these features
- Ensuring development seeks to produce a net gain in biodiversity by designing in wildlife, and ensuring any unavoidable impacts are appropriately mitigated for
- Supporting wildlife enhancements that contribute to the habitat restoration targets set out in the North Lincolnshire's Nature Map and in national, regional and local biodiversity action plans

- Improving access to and education/interpretation of biodiversity sites for tourism and the local population, providing their ecological integrity is not harmed

5.3 Methodology

5.3.1 Study area

Ecological surveys for the different species of flora and fauna have extended to the 'Zone of Influence', meaning the area over which the Scheme activities could impact / influence upon them. It is recognised that the Zone of Influence will vary for different species. The study area for each ecological survey is outlined in the relevant ecological survey reports in Appendix 5.1.

5.3.2 Survey methodology

A walkover survey and desk study were completed in November 2016. Species-specific surveys were subsequently completed between 2017 and 2018 (see Table 5.1).

Badger *Meles meles* was scoped out from further survey and assessment due to an absence of setts and field activity throughout the Scheme extent (CH2M, December 2016, Appendix 5.1). Similarly, no further botanical surveys beyond a Phase 1 habitat survey have been completed, as due to the nature of the solution and the construction methodology no notable habitat types will be affected.

Table 5.1: Ecological reports and surveys used to inform the biodiversity assessment (the survey reports can be found in Appendix 5.1 of this report. Reports relating to mitigation can be found in Appendix 5.2).

Survey Date	Survey Type	Report Title	Extent
September 2016.	Extended Phase 1 Habitat Survey, including scoping for protected species	Phase 1 Ecology Survey, Humber South Bank Appraisals Package: Winteringham Ings to South Ferriby (CH2M, December 2016).	Survey encompassed land between South Ferriby & Winteringham and also extended for approximately 1 km south of Sluice Road.
May – June 2017, extending into September for bats	Surveys for water vole <i>Arvicola amphibius</i> , otter <i>Lutra lutra</i> , great crested newt <i>Triturus cristatus</i> , bats and nesting birds	South Ferriby, North Lincolnshire Ecological Survey Report. Haycock & Jay Associates Ltd. (November 2017, Rev. 02).	The surveys extended to cover the current scheme extent.
Not applicable	Not applicable	Habitat Regulations Assessment. Stage 1 Habitat Regulations Assessment (Jacobs, August 2018).	Assessment of effects on Humber Estuary Ramsar, SAC and SPA.
2015/ 2016 and 2016/ 2017	Estuarine Bird surveys	Waterbird Assemblage Report. University of Hull, Institute of Estuarine & Coastal	Twice monthly survey of estuarine bird species within the Humber Estuary SPA and any significant assemblages to the

Survey Date	Survey Type	Report Title	Extent
		Studies (IECS 2017 and 2016). The 2015/16 monthly maxima results were used by Natural England to generate sensitivity analysis "risk maps".	south of the A1077 from Winteringham to South Ferriby Hall. The data has been used to inform the HRA.
April – July 2016	Breeding Birds	Winteringham – South Ferriby breeding bird surveys (Nyctea Ltd).	Survey extent between South Ferriby and Winteringham, also extended south of Sluice Road.
29 th May 1 st , 13 th & 26 th June 2018	Breeding birds	Breeding Bird Survey Results, Spring/Summer, University of Hull IECS, July 2018.	Encompassed current scheme extent, incorporating reed bed, coastal habitat and farmland.
June 2018	Water vole	Update Water Vole Survey Report, Haycock & Jay Associates Ltd, July 2018.	Survey of drains and ponds within scheme extent.
May 2018.	Barn owl	Winteringhams Ings to South Ferriby Flood Alleviation Scheme Barn Owl Survey Report. Jacobs, August 2018.	Identification of potential nest sites and suitable barn owl foraging habitat within the current scheme extent.
Not applicable	Water Vole Mitigation Strategy	Winteringhams Ings to South Ferriby Flood Alleviation Scheme. Jacobs, August 2018.	Approach to mitigation, based on the current scheme.
May 2016 to March 2017	Bat survey	Bat survey note for Ferriby Sluice, JBA Consulting.	Static detector & roost emergence surveys at Ferriby Sluice for a separate proposal.
6 th September 2018	Ecology assessment of Pond 29, applying Lincolnshire Local Wildlife Site Guidelines for freshwater habitats.	Ecological survey of a pond at Ferriby Sluice, North Lincolnshire, Martin Hammond Ecology, September 2018.	Survey to assess the ecological value of Pond 29, considering plants and aquatic invertebrates. An assessment for Crucifax ground-beetle was also undertaken.

The desk study involved obtaining records from Lincolnshire Environmental Records Centre (LERC) in 2016, as reported by CH2M (December 2016). Other data sources included: Multi Agency Geographic Information for the Countryside (MAGIC); Lincolnshire BAP (3rd ed. 2011 – 2020); JNCC (<http://jncc.defra.gov.uk>) for protected designation citations; aerial imagery and Ordnance Survey plans to guide survey design and the evaluation of findings.

Ecological survey methodologies adhere to industry standard methods, as described in the supporting ecology reports (Appendix 5.1).

The ecology surveys have extended to the ‘zone of influence’ of the proposed scheme. This is the likely maximal extent to which any element of the proposed scheme could significantly impact on an ecological feature, as long as the link between the source of impact, an impact pathway and a feature is maintained (CIEEM, 2016).

5.3.3 Limitations

No significant limitations are considered to influence the findings of the ecology surveys. A Breeding Bird Survey (BBS) completed by the Institute of Estuarine and Coastal Studies University (IECS, July 2018) was undertaken later in the season (late May–June) than normally completed for standard BBS methodology (April–June). This timing did not detract from the survey findings, as cold conditions prevailed during spring of 2018, with the potential for breeding bird activity to have been seasonally delayed. Whilst the BBS did not cover the whole breeding period, the breeding assemblages recorded during the survey are consistent with the habitats present (IECS, July 2018).

5.3.4 Assessment methodology

This assessment has been undertaken according to the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (CIEEM, 2016).

The significance of likely effects was determined through a four-stage process:

- Identification of the nature conservation value of each potentially important ecological feature present within the site and adjacent areas which may be affected by the proposed scheme.
- Identification of impacts and characterising the magnitude and nature of the impacts upon important ecological features during construction and operation.
- Identifying mitigation and, if required, compensation measures that are proposed to avoid, reduce or offset significant adverse effects; and
- Determining residual effects once proposed mitigation measures have been taken into account, and any necessary compensation measures.

An ecologically significant effect is defined as: ‘...an impact (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area’ (CIEEM, 2016).

Valuing ecological features

The CIEEM guidelines advocate an approach to the valuation of ecological features using a geographical framework where the value or potential value of an ecological resource or feature should be determined within a defined geographical context. The guidelines suggest a range of geographical parameters (see Table 5.2).

Table 5.2: Geographic values for ecological features

Geographic value (CIEEM, 2016)	Description of value
International (in this case within Europe, unless stated)	<ul style="list-style-type: none"> ■ International designated or candidate sites; SPA, SAC or Ramsar site, ■ International significant areas of habitat listed on Annex 1 of the Habitats Directive, ■ Globally threatened species

Geographic value (CIEEM, 2016)	Description of value
	<ul style="list-style-type: none"> ▪ Regularly occurring populations of internationally important species that are rare or threatened
National (UK or England, depending on legislative scope)	<ul style="list-style-type: none"> ▪ Nationally designated sites; National Nature Reserves or Sites of Special Scientific Interest (SSSI), including non-designated site that would meet published criteria for national designation. ▪ Significant populations of Principal Species identified in the Natural Environment and Rural Communities Act 2006 Section 41. ▪ Regularly occurring significant populations of species, i.e. those listed on the Wildlife and Countryside Act, 1981.
County (North Lincolnshire)	<ul style="list-style-type: none"> ▪ Regionally important sites and significant habitat extent of value for biodiversity; sites exceeding Local Wildlife Site (LWS) criteria, although not meeting national criteria for SSSI selection. ▪ Any regularly occurring, locally significant population of a species listed as being nationally scarce. A regularly occurring, locally significant population/number of a regionally important species. Sites maintaining populations of internationally/ nationally important species that are not threatened or rare in the region or county.
Local or parish (South Ferriby)	<ul style="list-style-type: none"> ▪ Local designations; Local Nature Reserves (LNR) and non-statutory designations for nature conservation. ▪ Local BAP habitats and features of value within the site context. ▪ Undesignated site / features that are good examples of a more widespread habitat.
Less than local , i.e. Zone of Influence (Within the context of the site and its environs)	Features with little or no biodiversity interest.

Assessment of effects

Once the ecological feature has been assigned a geographic level of value, the next stage is to identify and assess the significance of that impact upon the ecological feature. The guidelines advise that the determination should be whether a given impact will be ecologically significant or not at the geographic level of value assigned to that ecological feature. This means that the level of significance cannot be higher than the geographic value. However, it is sometimes possible that the level of significance of an impact may be lower than the receptor's geographic value when the effects of an impact may not be discernible or significant at that larger scale.

To determine likely significance of impact, the following characterisations are used as appropriate:

- Impact type - direct or indirect, positive or negative.
- Magnitude of impact – the 'amount' or intensity of an impact. This may sometimes be synonymous with 'extent' (see below) for certain impacts, such as habitat loss. For mortality, it may be the number of individuals killed.

- Extent of impact – the area over which the impact will be felt.
- Duration of impact – how long it will occur. The guidelines suggest that ecological impact durations should be described in terms of ecological characteristics (e.g. species life-cycles/longevity) rather than human timeframes. The definitions of duration that have been used to guide this assessment are detailed in Table 5.3.
- Timing of impact – when it will occur, taking particular note of seasonality.
- Frequency of impact – how often it will occur.
- Reversibility of impact – whether recovery or reinstatement is possible.

Table 5.3: Definitions of duration of impact for assessment of effects

Duration	Habitat	Species
Short-term	The typical regrowth period for many grass and herb communities – as a rough guide, up to two years.	Impact is measurable up to one (breeding/wintering, etc.) season – as a rough guide, up to a year for fauna.
Medium-term	The typical regrowth period for many shrub and hedge communities – as a rough guide, two to eight years.	Impact is measurable up to one typical reproductive life-span (in the wild). This varies greatly depending on species, but generally anything from one year to 5 years as a rough guide for most fauna.
Long-term	A period lasting longer than the typical scrub/hedge regrowth period (including woodland regrowth periods) ² - as a rough guide, more than 8 years.	Impact is measurable over several (species) generations.
Permanent	An impact where no reasonable chance of recovery/restoration is evident within the foreseeable future.	

Once the overall likely significance has been determined, a qualitative level of probability is assigned to the prediction (e.g. probable, unlikely, etc.). Confidence is based on the likelihood of the impact occurring, the abundance and quality of available baseline data used, and the degree of understanding of the stated impact ‘pathways’ and habitat responses.

The significance of the effects resulting from the proposed scheme are assessed before and after mitigation. Any significant residual effects remaining after mitigation, compensation and enhancement are the factors to be considered against legislation and planning policy in determining the Scheme.

5.4 Existing environment

The detailed baseline conditions for the ecological receptors, potentially impacted by the proposed scheme, are provided in the supporting ecology reports (Appendix 5.1). Relevant key findings for this assessment are detailed below.

5.4.1 Designated sites

The location of statutory and non-statutory designations is shown on Figure 5.1 (Appendix 1.1) and further listed in Table 5.4. Three LWS: Fox Covert Quarry North West, South Ferriby Churchyard and South Ferriby Chalk Springs do not form hydrological or terrestrial

² This excludes ancient woodland and veteran trees which, if lost, represent a permanent impact.

connections with the proposed scheme and are suitably distant or separated by residential housing. As such, no pre-mitigation effects upon these designations are likely. Therefore, they are scoped out of the assessment.

Table 5.4: Statutory and non-statutory designations

Site Name	Description	Relevance to scheme
Statutory Designations		
Humber Estuary Ramsar site	<p>The estuary is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes and coastal brackish/saline lagoons.</p> <p>The Ramsar site contains an internationally important assemblage of waterfowl and an internationally important population of regularly occurring migratory bird species.</p> <p>The site supports a breeding colony of grey seals <i>Halichoerus grypus</i> at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast.</p>	<p>The landward toe of the existing flood embankment forms the designation boundary, so the proposed works on the frontage to the west of Ferriby Sluice fall within the Ramsar boundary. The qualifying features potentially within the zone of influence of the proposed scheme are:</p> <ul style="list-style-type: none"> • criterion 1: near natural estuary; • criterion 5: waterfowl assemblage; and • criterion 6: specific waterbird species <p>Qualifying features not relevant to the Scheme, due to their presence beyond the Schemes zone of influence include criterion 3 grey seal <i>Halichoerus grypus</i>; mudflats visible from the Scheme extent are not a seal haul out site and natterjack toad <i>Epidalea calamita</i>: the nearest colony is at Saltfleetby-Theddlethorpe Dunes National Nature Reserve.</p> <p>Criterion 8 for river and sea lamprey <i>Lampetra fluviatilis</i> and <i>Lampetra marinus</i>. These species are not likely to be relevant to the Scheme due to no works proposed to the hydrology of the Humber Estuary and River Ancholme,</p>
Humber Estuary SAC	<p>The estuary includes Atlantic salt meadows and a range of sand dune types in the outer estuary, together with sandbanks which are slightly covered by sea water all the time, extensive intertidal mudflats, Salicornia and other annuals colonising mud and sand and coastal lagoons.</p> <p>Significant fish species include river lamprey <i>Lampetra fluviatilis</i> and sea lamprey <i>Petromyzon marinus</i>. Grey seals come ashore in autumn to form breeding colonies on the sandy shores of the south bank at Donna Nook.</p>	<p>As above, the SAC forms the same boundary as the Ramsar.</p> <p>The qualifying feature potentially within the zone of influence of the proposed scheme is:</p> <p>Estuarine and intertidal habitats (estuaries)</p> <p>Species of the SAC include sea lamprey, river lamprey and grey seal. They are not likely to be relevant to the Scheme, as described above under the Ramsar.</p>

Site Name	Description	Relevance to scheme
Humber Estuary SPA	<p>The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern <i>Botaurus stellaris</i>, marsh harrier <i>Circus aeruginosus</i>, avocet <i>Recurvirostra avoetia</i> and little tern <i>Stern albigularis</i>.</p>	<p>As above, the SPA forms the same boundary as the Ramsar.</p> <p>The qualifying features potentially within the zone of influence of the proposed scheme are:</p> <p>Article 4.1 species: avocet, bittern, hen harrier, golden plover, bar-tailed godwit, ruff, bittern, marsh harrier, little tern;</p> <p>Article 4.2 species: shelduck, knot, dunlin, black-tailed godwit, redshank, knot; and</p> <p>The waterbird assemblage.</p>
Humber Estuary SSSI	<p>The estuary contains a series of nationally important habitats including the estuary itself (with its component habitats of intertidal mudflats, sandflats and coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters.</p> <p>The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seals, river lamprey and sea lamprey, a vascular plant assemblage and invertebrate assemblage.</p>	<p>The qualifying features potentially within the zone of influence of the proposed scheme include international important wildfowl and wader populations and nationally important assemblages of breeding birds of lowland open waters and their margins: bittern, marsh harrier, avocet and bearded tit <i>Panurus biarmicus</i>.</p> <p>Species associated with the SSSI and not likely to be relevant to the Scheme include grey seal, river and sea lamprey. Non-relevance relates to these species not being within the zone of influence.</p>
Non-Statutory Designations		
East Drain LWS	<p>A stretch of the northward-flowing, canalised New River Ancholme. It includes the 4 m wide channel plus steep banks on both sides. Cattle graze the eastern bank and have access to the water's edge, whereas the western bank is unmanaged</p>	<p>0.3 km south of the proposed scheme, with hydrological connections with the international sites listed above.</p>
Fox Covert Quarry North West LWS	<p>Botanically-rich area rising steeply above the southern shore of the Humber Estuary appears to be formed of chalk rubble excavated from the adjacent Fox Covert Quarry. Scrub and developing woodland occupy some of the site, but elsewhere the lack of soil has allowed plants indicative of high quality chalk grassland to flourish.</p>	<p>1.0 km east of the proposed scheme, with habitat connections via the Humber Estuary coastal habitats. Due to distance no effects likely. Scoped out.</p>

Site Name	Description	Relevance to scheme
Manor House Farm Field LWS	A rectangular site close to the south bank of the Humber Estuary, comprising a large, shallow, central depression surrounded by slightly higher ground. The centre is occupied by a lake when the water table is high. Elsewhere there is a rich, neutral to calcareous, dry grassland sward with occasional small bushes of hawthorn, all surrounded by well-maintained hedges. The diverse wetland vegetation includes a few species indicative of brackish conditions. Cattle are free to roam over the whole site, they vegetation is short throughout.	0.1 km south of the proposed scheme with Sluice Road forming a barrier between terrestrial habitats. There are no direct hydrological links between the proposed scheme and the LWS.
South Ferriby Chalk Springs LWS	This is a wooded hillside at the northern end of the west-facing scarp of the Lincolnshire Wolds. Less than 1 km south of the Humber Estuary, the site lies at an altitude of between 20 m and 50 m above sea level. The major wildlife interest is a rich aquatic invertebrate fauna associated with a shaded and largely un-vegetated wetland complex in the northern part of the wood.	0.4 km south of the proposed scheme, with no direct habitat or hydrological connections. This is due to the presence of residential housing. Scoped out.
South Ferriby Churchyard LWS	This is a typical churchyard, in that a range of habitats are present, including grassland, ruderal areas, large trees casting much shade, other woody vegetation, stonework and paths. Variations in grassland management are also evident, leading to variations in sward quality.	south of the proposed scheme, with no direct habitat or hydrological connections. This is due to the presence of residential housing. Scoped out.
Ancholme Fields LWS	Large grassland, wetland and woodland complex, located near the Humber Estuary in the lower Ancholme valley, all parts are less than 5 m above sea level.	0.2 km south of the proposed scheme. Hydrological connections via East Drain.
New River Ancholme LWS	Comprises the 20-30 m wide channel of the canalised, northward-flowing New River Ancholme, plus a narrow strip of land on both sides. It passes through a broad and mainly arable floodplain that is less than 5 m above sea level. The site is 24 km long, extending upstream from the Humber Estuary at South Ferriby, via Brigg, to a point west of South Kelsey. In most places, the drier parts of both banks support a flora that is dominated by coarse or weedy vegetation, plus a scatter of more interesting species typical of good neutral grassland.	Adjacent to the Scheme at Ferriby Sluice flood gates, directly connected to the Scheme.

5.4.2 Notable habitats

MAGIC (accessed 19/07/2018) highlights the presence of the three UK BAP Priority Habitats (Habitats of Principal Importance, NERC 2006) within and adjacent to the Scheme (zone of influence) (see Figure 5.1):

- **Lowland fens:** this habitat receives water and nutrients from the soil and rock, and ground water from rainfall. The habitat usually supports vegetation associated with aquatic environments. However, the grassland highlighted as this habitat type within the Scheme is agriculturally improved.
- **Coastal floodplain grazing:** referred to as inundated pasture or meadow with ditches to maintain water levels. The phase I habitat survey otherwise identified this feature to be arable.
- **Lowland calcareous grassland:** associated with Manor Fields Farm LWS, located 58m south of the Scheme and separated by Sluice Road. The habitat is associated with agricultural enclosures upon well-drained base rich soils that give rise to a variety of lime-loving herbs and grasses.

Lincolnshire Biological Records Centre (LBRC) also highlighted the presence of priority habitats in the wider context, including coastal saltmarsh and mud flats associated with Humber Estuary SAC, SPA and SSSI).

The broad habitats occurring within and adjacent to the proposed scheme are shown as Figure 5.2 (Appendix 1.1). They include:

Estuarine habitats

Intertidal mudflats and reedbed (common reed *Phragmites australis*) make up the largest proportion of the estuarine zone. Areas of saltmarsh are less visible where common reed persists, the exception here is where sea couch grass *Elytrigia atherica* dominates areas between reedbed, reflecting the upper reaches of a salt marsh community. The value of the estuarine habitat is reflective of the designations; therefore, they are of **international importance** due their association with the Humber Estuary SAC and Ramsar site.

River Ancholme

The River Ancholme (**local importance**) feeds into the Humber Estuary, with Ferriby Sluice located at the mouth of the river. The sluice is an engineered structure with large stone-built wing walls. The surrounding embankments are predominantly mud flats and reedbed. The river section south of Ferriby Sluice is canalised, approximately 8m wide and slow flowing. The river embankments support marginal vegetation that is approximately 4m wide; characteristic species include common reed, branched burr-reed *Sparganium erectum* and reed sweet-grass *Glyceria maxima*. Tall herbs also persist including common nettle *Urtica dioica*, cow parsley *Anthriscus sylvestris* and hogweed *Heraculum sphondylium*.

Grassland

Parcels of semi-improved neutral grassland occur to the north of Sluice Road and along the embankments of drains. Grass species dominate including false oat-grass *Arrhenatherum elatius*, cock's-foot *Dactylis glomerata*, Yorkshire-fog *Holcus lanatus*, creeping bent *Agrostis stolonifera*, timothy *Phleum pratense* and occasional tufted hair-grass *Deschampsia cespitosa*.

Herbaceous plant species include ribwort plantain *Plantago lanceolata*, vetch species *Vicia spp.*, creeping buttercup *Ranunculus repens*, white clover *Trifolium repens* and common mouse-ear *Cerastium fontanum*. In lower growing areas mouse-ear hawkweed *Pilosella*

officinatum, autumn hawkbit *Leontodon autumnalis* and pineapple weed *Matricaria discoidea* are present.

Species poor semi-improved grassland is present along the existing flood embankment, which is maintained under a regular mowing regime. To the west of Ferriby Sluice the existing embankment and associated grassland falls within the boundaries of the Humber Estuary Ramsar and SAC. The grassland is a non-functional habitat of the designations.

Two areas of improved grassland occur within the Scheme extent, one area lies to the north of Sluice Road (adjacent to Fulseas Drain) and the second area is located west of CEMEX. Both grasslands are maintained as a low growing sward, with a poor vegetative structure. The grassland north of Sluice Road is shown on MAGIC as a priority habitat for Lowland fens, however, survey data reveal this grassland to be a poor example of this priority habitat type, although it is capable of being restored.

Collectively, the grasslands are species poor and are therefore of **less than local importance**.

Arable

There is a single arable field at the proposed scheme's eastern extent, which is classified as a Priority Habitat for Coastal floodplain grazing. The field has remained in regular cultivation between 2016 and 2018 and is a poor example of the priority habitat classification, therefore, the field is of **less than local importance**.

Tall ruderal

A small field within the coastal zone, immediately west of Ferriby Sluice is unmanaged and characterised by tall ruderal species, including common nettle mugwort *Artemisia vulgaris*, great willowherb *Epilobium hirsutum* and frequent patches of bramble *Rubus fruticosus agg.*

Due to the small extent of this habitat and presence of common and widespread species, tall ruderal is of **less than local importance**.

Plantation

There is a small area of semi-mature plantation to the west of CEMEX, which supports poplar *Populus spp.* and alder *Alnus spp.* As the plantation forms the only area of woodland within the Scheme extent, it is of **local importance**.

Standard trees and scrub

Semi-mature trees mostly occur along the field boundaries in association with hedgerows, road verges and an Environmental Agency car park south of Sluice Road. The most notable trees within the Scheme area include two mature horse chestnuts *Aesculus hippocastanum* immediately west of Ferriby Sluice, within an area of tall herb. Young scattered scrub predominantly occurs to the south of the existing flood defence embankment.

Whilst the majority of trees within the proposed scheme are semi-mature, they are integral landscape features that are of **local importance**.

Hedgerows

Hedgerows throughout the Scheme are species poor and dominated by hawthorn *Crataegus monogyna*. The hedgerows bounding fields to the north of Sluice Road are managed to a regular height and width of 2 x 2 m.

Hedgerows offer structural variation throughout the landscape and form important wildlife corridors to facilitate the movement and migration of flora and fauna. Hedgerows are of **local importance**.

Standing water (County Wildlife Assessment of Pond 29)

There is a single freshwater pond (P29) immediately south of the existing flood embankment, which equates to 1.05 hectares and supports dense stands of common reed around two-thirds of the pond, with small localised areas of sea club-rush *Bolboschoenus maritimus*. The LWS assessment (Hammond, September 2018) confirmed the pond did not meet the qualifying threshold for botanical interest or indicator species, although did potentially qualify for supporting reedbed habitat at least 0.5 ha in extent.

It is only required to meet one of the criteria for potential Lincolnshire LWS selection, therefore the assessment has concluded that Pond 29 meets the LWS criteria under Freshwater Guidelines FW1 (aquatic invertebrate fauna).

Drains

A linear drain runs parallel with the existing embankment, which connects with a wider network of drains along the edges of fields between the estuarine zone and Sluice Road. Overall, the drain network has a consistent geomorphological character; v-shaped ditch profile, embankments angled between 45-55 degrees and the main water channel ranging between 1-2m width. Water levels are likely to be variable relative to rainfall and wider landscape drainage.

The complex drain network throughout the Scheme extent and wider landscape are important hydrological features that support reedbed habitat, therefore, they are of **local importance**.

5.4.3 Fauna

A summary of protected and notable species findings relevant to the Scheme is provided below.

Bats

JBA Consulting undertook a survey (May 2016 to March 2017) of Ferriby Sluice as part of a separate project to replace the pointing doors of the sluice, with the findings from this survey used to help inform potential effects on bats arising from the proposed scheme. The survey recorded the presence of a daubenton *Myotis daubentonii* maternity roost (Figure 5.3, Appendix 1.1) within the east wing wall (seaward side) of Ferriby Sluice. The surveys counted 52 bats emerging during a single visit in July 2016. Based on this finding, the bat roost was referred to as being of **regional value**.

Bat transect surveys completed by Haycock and Jay Associates in spring, summer and autumn 2018 recorded moderate levels of bat activity, with common pipistrelle *Pipistrellus pipistrellus* and daubenton sp. most commonly recorded. Record of passes included soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared *Plecotus auratus* and noctule *Nyctalus noctula*. Static detector monitoring recorded high levels of bat activity, with a total of 15,201 passes at location A, mostly *Myotis* sp. Common pipistrelle and soprano pipistrelle and 1,060 passes at location B (Figure 5.3, Appendix 1.1), dominated by common pipistrelle, with moderate levels of daubenton activity.

Pond P21 (Figure 5.3, Appendix 1.1, located to the west of the CEMEX cement works and the most western extent of the proposed scheme) was identified as being the most important feature for foraging bats. In addition, a single Nathusius pipistrelle *Pipistrellus nathusii* was

recorded on a static detector at this location. This species is the rarest of the country's pipistrelle species, although considered to be under recorded in the UK.

The scheme encompasses typical habitat used for bat commuting and foraging, including a network of ditches, open water, hedgerows, shrubs and trees. Relative to the bat transect survey findings and the typical habitats present, bat population foraging and commuting with the Scheme extent are of **local importance**.

Water vole

A summary of the water vole survey findings completed by Haycock and Jay in 2017 and 2018 are shown in Table 5.5, with the full survey findings detailed in the supporting ecology report (Appendix 5.1). In 2017 and 2018 water voles were recorded in the following drains (see Figure 5.4):

- 2017: 1a, 1b, D3 and 3b.
- 2018: D3, 3b, 10 and 37.

Drains 1a, 1b, D3 and 3b are all hydrologically linked, with a culvert under Sluice Road remaining passable for water voles. Drain 10 and 37 are located at the Scheme's western extent, running parallel with CEMEX. Drains 3b and 1b were found to support a medium population of water voles, with all other remaining drains supporting a low water vole population.

Mink scats have been recorded in four ditches (C, 1d, 3b, 10 and 37). The presence of mink is likely to be widespread throughout the Scheme extent and the surrounding landscape where favourable hydrological connections are present. Mink presents a significant threat to the local water vole population.

Water vole are assigned geographic category of **local importance** due to their legal protection and being a species of principal importance.

Table 5.5: Summary of water vole survey findings 2017 and 2018

Ditch ref	Ditch Character	2017 Findings	2018 Findings
A	Large field ditch with steep embankments, south of Sluice Road. Densely vegetated with common reed. Sub-optimal for water vole due to persistent dry conditions during 2017 and 2018.	No water vole, drain was dry.	No water vole, drain was dry.
B	Large field ditch with steep embankments. Densely vegetated with common reed. Sub-optimal for water vole.	No water vole, drain was dry.	No water vole, drain was dry.
C	Large ditch adjacent to coastal habitat, common reed dominated, with areas of scrub. The central section of ditch is water logged with areas reaching a depth of 10-20 cm. The habitat was noted as suitable for water vole in 2018.	No water vole, mostly dry. Mink scat observed.	No water vole, mostly dry, central section of drain holds water.
D1	No ditch character, otherwise a hedgerow.	No drain present	No drain present
D2	Small field ditch with hedgerow, part wet with floating sweet-grass <i>Glyceria fluitans</i> ,	No, rodent feeding station,	No water vole, drain was dry.

Ditch ref	Ditch Character	2017 Findings	2018 Findings
	willowherb <i>Epilobium</i> and shrubs. The ditch is suitable for water vole.	not confirmed as water vole.	
D3	Ditch with steep embankments, which are densely vegetated by scrub and tall ruderal. Water depth <10 cm with a deep silt layer. The ditch is 1.5 m wide and is suitable for water vole.	Water vole present , one latrine located.	Water vole present , latrine in north of ditch.
D4	Ditch located adjacent to a hedgerow, 1 m wide & water depth of 20-30 cm. Vegetation characterised by scrub and tall ruderal.	No, rodent feeding station, not confirmed as water vole.	No water vole, although suitable habitat.
D5	Ditch located south of Sluice Road with steep earth banks, approx. 1 m wide and water depth 20-30 cm in 2017. Tall ruderal and scrub present. The ditch is suitable for water vole.	No, field vole only.	No water vole, drain was dry.
1a	Large ditch running parallel with existing embankment, steep embankments and water depth ranges from 50-100 cm. Dense common reed and patches of scrub. The ditch is suitable for water vole.	Water vole present , latrines located.	Potential burrow & feeding remains typical of water vole.
1b	Continuation of 1a with steep embankments and water depth ranges from 50-100 cm. Dense common reed and patches of scrub. The ditch is suitable for water vole.	Water vole present , latrines located.	No water vole, although suitable habitat.
1c	Continuation of 1b with steep embankments and water depth ranges from 50-100 cm. Dense common reed and patches of scrub. The ditch is suitable for water vole.	No water vole.	No water vole, although suitable habitat.
1d	2 m wide ditch running parallel with existing embankment. Water depth 50-100 cm and dominated by common reed. Suitable for water vole.	No water vole.	No water vole, although suitable habitat. Mink scat observed.
1e	Continuation of 1d, wide ditch running parallel with existing embankment. Water depth 50-100 cm and dominated by common reed. Suitable for water vole.	No	No water vole, although suitable habitat.
3a	Ditch bordering a residential garden, approx. 1 m wide and 50 cm deep. A hedgerow runs parallel with the ditch. Sub-optimal for water vole due to lack of in-channel vegetation.	No	No water vole, although suitable habitat.
3b Fulseas Drain	Linear ditch to the south of the existing embankment, steep sided with tall grass species. In channel water depth 20-30 cm with yellow flag-iris <i>Iris pseudacorus</i> , water mint <i>Mentha aquatica</i> and brooklime	Water vole present , latrines and other field signs.	Water vole present , latrines and other field signs.

Ditch ref	Ditch Character	2017 Findings	2018 Findings
	<i>Veronica beccabunga</i> . The ditch is suitable for water vole.	Mink scat observed.	Mink scat observed.
4	Ditch to the south and running parallel with the existing embankment. Steep sided with water depth ranging between 50-100 cm. Dense stands of common reed present. The ditch is suitable for water vole.	No water vole, although suitable habitat.	No water vole, although suitable habitat.
5	Ancholme River, canalised with the tidal Ferriby Sluice at the river's mouth. Width of river is approx. 8 m, with the banks reinforced with metal sheet piling and wooden jetties. Adjacent vegetation comprises tall grassland with patches of reeds and sedges. The river is suitable for water vole.	No, otter spraint located.	No water vole, although suitable habitat. several field signs of field vole identified. Otter spraint & feeding remains.
10	Large field ditch at edge of arable field, adjacent to CEMEX. Steep-sided embankments and channel width approx. 3 m and varying from 0.5 to > 1 m deep. The ditch is suitable for water vole.	No, mink scat.	Water vole present , several water vole latrines identified
37	Linear ditch running along the edge of an arable field, approx. 3 m wide with steep embankments colonised by tall grasses.	No, mink scat.	Water vole present , several water vole latrines identified
East Drain	Linear ditch with steep sites and channel width approx. 3 m. The embankments are characterised by tall grasses and patches of tall ruderal.	Not surveyed	No water vole, although suitable habitat.
P29	Open body of water surrounded by dense stands of common reed. The waterbody forms hydrological connections with ditch 1e.	Not surveyed	No water vole, although suitable habitat. Otter spraint and feeding remains.
D6	A large ditch between a hedgerow and dirt track. It has steep earth banks and a sense cover of grass and tall ruderal species. Predominately dry with <10 cm of water.	Not surveyed	Suitable habitat.
D7	A large ditch with steep earth banks, vegetated with dense grass and tall ruderal vegetation. The ditch is shallow with <10 cm of water present.	Not surveyed	Suitable habitat.
P31	Garden pond with open water and an area dominated by reed. The banks are shallow, and vegetation is frequently mown.	Not surveyed	Suitable habitat.

Ditch ref	Ditch Character	2017 Findings	2018 Findings
P42	Garden pond with open water, shallow banks with limited vegetative cover and regularly mown.	Not surveyed	Suitable habitat.
P43	A large pond in shallow scrape, heavily peached by cattle and bank vegetation dominated by rushes.	Not surveyed	Sub-optimal

Otter

Otter feeding remains and spraints were found on the River Ancholme during the Phase 1 Habitat survey in September 2016 and during the water vole survey in 2017 and 2018. Further evidence of otter (spraint and feeding remains) was found in 2018 at pond P29. The River Ancholme is likely to form the core habitat for otter, with potential holt establishment along the more secluded sections of the river. Otters occupy a large home range of approximately 40 km along accessible watercourses, therefore, sporadic evidence of feeding remains, and spraints is not uncommon. Evidence of otter at Pond 29 suggest the pond supports fish populations as a feeding resource, although the surrounding pond habitat does not offer suitable opportunities (exposed and no holes or crevices) for holt establishment. Otters are assessed to be of **local importance**.

Estuarine birds

Survey data for the Humber Estuary SPA is extracted from the University of Hull, Institute of Estuarine & Coastal Studies Waterbird Assemblage Report (IECS 2017), Waterbird monthly maxima 2016/17 results (IECS 2017) and sensitivity analysis (information from Natural England using IECS' 2015/6 survey results). This data has been analysed to inform the HRA, with key summary findings detailed below.

- The inland habitats within the proposed scheme were not identified as key habitats for SPA/Ramsar species. However, some birds (e.g. ruff *Calidris pugnax*, golden plover *Pluvialis fulva*, dunlin *Calidris alpina*) on occasions would use mud immediately in front of proposed works and inland grassland/arable and wetland habitats such as Pond 29, although with much lower counts than the key habitats. A small number of ducks were observed to use the sluice embankment of the River Ancholme.
- The 2016-17 waterbird assemblage surveys by IECS recorded that the estuary nearest the proposed works had records of some SPA birds in significant numbers (10% Humber population).
- The estuary nearest to the proposed scheme is of particular importance for avocets (Annex 1 species), supporting counts of national and international importance near Read's Island (8.6% of the GB population between 1998-2002). Avocet are breeding on Read's Island in the spring/summer (one of few sites on the Humber) and also post-breeding and passage individuals feeding in excess of international importance threshold at other times of the year.
- Marsh harrier has been observed hunting along the intertidal habitat, although are not breeding within the Scheme extent. However, marsh harrier is known to breed on Read's Island, with the wider habitats along the estuary functioning as important foraging habitat.
- Usage of fields beyond the estuary and within the Scheme, north and south of the A1077 (west of CEMEX) supported few bird species (golden plover and curlew *Numenius arquata*), with no evidence to confirm established feeding patterns. Overall, the wider fields were not identified to be important to waterbirds.

The Humber Estuary SSSI identifies the estuary to regularly support nationally important populations of wintering and passage waterfowl. In addition to the species referenced above, species include dark-bellied brent goose *Branta bernicla bernicla*, shelduck *Tadorna tadorna*, wigeon *Anas Penelope*, teal *Anas crecca*, pochard *Aythya ferna*, scaup *Aythya marila*, goldeneye *Bucephala clangula*, oystercatcher *Haematopus ostralegus*, ringed plover *Charadrius hiaticula*, grey plover *Pluvialis squatarola*, lapwing *Vanellus vanellus*, knot *Calidris canutus*, sanderling *Calidris alba*, lack-tailed godwit *Limosa lapponica*, curlew *Numenius arquata*, redshank *Tringa tetanus* and turnstone *Arenaria interpres*. In the majority of cases, these species are likely to use estuarine habitat, although species such as lapwing and curlew could use inland fields.

Estuarine bird species are of **international importance** as the Humber Estuary is an important resource for these breeding and migratory bird species.

Breeding birds

The breeding bird survey completed by IECS between late May and June 2018 encompassed habitats within the Scheme extent, including reedbed, hedgerows and scrub and water features: pond P21 / P29, East Drain and the River Ancholme at Ferriby Sluice.

The main bird species observed within the broad habitat types are listed in Table 5.6, which reflects a variety of warbler species within reedbed habitat and common and widespread species throughout the wider habitats. No SPA species were recorded within the proposed scheme. However, species recorded during the survey and are also listed on the Humber Estuary SSSI include bearded tit *Panurus biarmicus*, sedge warbler *Acrocephalus choenobaenus*, reed warbler *Acrocephalus scirpaceus*, Reed bunting *Emberiza schoeniclus*, Shelduck *Tadorna tadorna* and lapwing.

Table 5.6: Bird species observed during the breeding bird survey

Habitat	Species	Status
Reedbed	Sedge warbler <i>Acrocephalus schoenobaenus</i>	
	Reed warbler <i>Acrocephalus scirpaceus</i>	
	Cetti's warbler <i>Cettia cetti</i>	Sch. 1 Wildlife and Countryside Act (WCA)
	Reed bunting <i>Emberiza schoeniclus</i>	Amber BoCC *
	Bearded tit <i>Panurus biarmicus</i>	Sch. 1 WCA
Hedgerow, scrub & wooded areas	Blue tit <i>Cyanistes caeruleus</i>	
	Great tit <i>Parus major</i>	
	Wren <i>Troglodytes troglodytes</i>	
	Chaffinch <i>Fringilla coelebs</i>	
	Gold finch <i>Carduelis carduelis</i>	
Open water	Mute swan <i>Cygnus olor</i>	Amber BoCC
	Mallard <i>Anas platyrhynchos</i>	Amber BoCC

Habitat	Species	Status
	Coot <i>Fulica atra</i>	
Water-logged/mud area	Shelduck <i>Tadorna tadorna</i>	
	Lapwing <i>Vanellus vanellus</i>	Red BoCC
	Oystercatcher <i>Haematopus ostralegus</i>	

*BoCC (Birds of Conservation Concern, Eaton *et al*, 2009), refers to population status of UK birds, Red: birds of high conservation concern, Amber: medium conservation concern, Green: favourable conservation status.

Whilst a small number of species are Birds of Conservation Concern amber listed or Schedule 1 species of the Wildlife and Countryside Act 1981 (as amended), no rare species or notable bird assemblages were noted, although species were observed that are listed on the Humber Estuary SSSI. All species observed were typically characteristic of the broad habitat types and are collectively of **local importance**.

Barn owl

During the Phase 1 Habitat survey (September 2016), a barn owl was sighted within the area of Winteringham, approximately 1 km from the proposed scheme. LBRC identified 46 records for barn owl, dating 1972 -2014, reflecting an historical and widespread occurrence of this species.

A barn owl walkover survey completed in May 2018 encompassed the Scheme extent and a section of the River Ancholme, see Figure 5.6, Appendix 1.1 The survey identified the presence of four artificial nest boxes (B1-B4) and an open fronted agricultural building (F1). Box B1 is located within 80 m of the proposed scheme and could be used by nesting barn owl. This assertion is supported by observation of barn owl foraging in the adjoining drains to B1 (Haycock and Jay Associates, September 2017).

The potential of B1 as a barn owl nest site is based on the tussock forming grassland along the embankments of the surrounding drain network providing prime barn owl habitat and due to observing barn owl foraging along the existing flood embankment. Barn owl was also observed commuting / foraging along the embankments of the River Ancholme. Barn owl is considered to be of **local importance**.

Great Crested Newt

Haycock and Jay Associates (November 2017, Rev02) completed a Habitat Suitability Index (HSI) (Oldham *et al.*, 2001), Environmental DNA (eDNA) and population surveys of ponds listed in Table 5.7. The supporting ecology survey report shows the location of all surveyed ponds with key findings relevant to the Scheme shown as Figure 5.7 (Appendix 1.1, with the full great crested newt (GCN) *Triturus cristatus* findings presented in the South Ferriby, North Lincolnshire Ecological Survey Report (Haycock and Jay, 2017) (Appendix 5.1).

Pond 35 (Figure 5.7, Appendix 1.1), which was found to support a small population of GCN, is located 500 m to the south of the Scheme and separated by developed land and Sluice Road. Ponds 36/37, 39 and 40 tested positive eDNA, although no GCN were detected during the surveys. Absence is considered to be associated with a low GCN population, influenced by the presence of fish.

Pond 43, located 50 m south of the Scheme was tested positive for eDNA in 2017 and 2018. However, no GCN were recorded during six survey visits in 2017, which involved bottle trapping, torchlight inspections, egg searching and netting.

It was concluded that Pond 43 supports an assumed small population of GCN. The presence of cattle, which have poached the ponds perimeter and grazing ducks and geese may predate GCN eggs through grazing on emergent and embankment vegetation. As a consequence, the pond is unlikely to support a viable population of GCN.

There is a low risk that GCN are utilising terrestrial habitats within the Scheme extent, for the following reasons:

- Sluice Road forms a semi-permeable barrier between P43 and the Schemes working area.
- There are no culverts between P43 and the existing habitats to the north of Sluice Road.
- No GCN have been recorded in Pond P29, located to the north of Sluice Road and within the Scheme area.
- Within 250m of Pond 43 the Scheme bisects low value GCN habitat; closely grazed improved and semi-improved grassland.
- The GCN population of P43 is likely to be linked to pond 35 to the south and therefore individuals are likely to be predominantly utilising habitats to the south of P43.

As the GCN population is considered low within the Scheme area, the species is considered to be of **local importance**.

Table 5.7: Summary of amphibian survey findings between 2017 – 2018

Pond ref	HSI Finding	eDNA Finding	GCN Presence / Absence Finding	Population Class
21	Average	Inconclusive	Absent	-
22	Good	Negative	Absent	-
23	Poor	Negative	No access	-
24	Below Average	Negative	Absent	-
29	Good	Negative	Absent	-
31	Average	Negative	Absent	-
33	Good	Negative	Absent	-
34	Good	Negative	Absent	-
35	Excellent	Positive	Present (fish)	Small population
36/37	Excellent	Positive	Absent (fish)	-
38	Dry	NA	NA	-
39	Average	Positive	Absent (fish)	-

Pond ref	HSI Finding	eDNA Finding	GCN Presence / Absence Finding	Population Class
40	Good	Positive	Absent (fish)	-
41	Poor	Negative	Absent	-
42	Good	Negative	Absent	-
43	Good	Positive	Absent	Assumed small population

*Full survey findings for all ponds listed in Table 5.7, see Appendix 5.1. Figure 5.7 in Appendix 1.1 shows the key findings relative to the Scheme.

Reptiles

During the ecology walkover survey in 2016 (CH2M, November 2016) the existing flood grass embankment, surrounding reed dominated drains and aquatic features, including Pond 29, the River Ancholme and East Drain were noted for their reptile potential. This potential primarily related to grass snake *Natrix natrix*, which was highlighted by LERC as being possibly present, although only two records were available from 1977. However, the LBAP for Lincolnshire (2011 – 2020) identifies the presence of grass snake across the county.

The complex network of coastal and inland habitat provides wide basking, feeding and hibernation opportunities for grass snake; they are a highly mobile species that can traverse up to 4 km in a single day to seek prey. Grass snake also favour open water; therefore, the presence of East Drain and the River Ancholme offer wider migrating and feeding opportunities.

Due to the favourability of habitat within the Scheme extent and surrounding environs, grass snake is assumed present and of **local importance**.

Fish

The Humber Estuary SAC and SSSI citation lists river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*. The HRA (Jacobs, August 2018) concluded no direct effects upon these species during construction of operation due to no physical damage to aquatic habitats. Spawning/nursery habitat will be further upstream, so juvenile lamprey (ammocoetes) will not be present within the channel substrate). Based on this assessment and based on these two species being generally widespread throughout UK waters, both sea and river lamprey are of **local importance** within the context of the Scheme.

Invertebrates

During the LWS assessment of P29, forty-six aquatic macro-invertebrates were recorded. This is a high count for a single visit, although of the species recorded, none of these are scarce or threatened in a national context. However, the species recorded were noted (Hammond, September 2018) as being of Local Importance, including mostly fresh water invertebrate species and one brackish-water species (amphipod shrimp *Gammarus duebeni*), which was present in good numbers.

The pond was confirmed as having suitability for the Crucifix ground-beetle *Panagaeus cruxmajor*, although presence can only be confirmed using pitfall trapping.

Other Fauna

Brown hare *Lepus europaeus* has been observed within arable fields to the south of Sluice Road throughout the 2016 – 2018 survey period. LERC highlighted 58 records for brown hare, although these records refer to the south, where there is a larger expanse of arable fields.

The potential presence of brown hare within the Scheme extent is considered low due to the presence of small field parcels sandwiched between the Humber Estuary and Sluice Road to the south. Where the proposed embankment extends along the western edge of CEMEX (south of Sluice Road) there is potential for brown hare to be present, although numbers are likely to be extremely low.

Brown hare are of less than local importance as there is a low risk of their presence within the Scheme extent, thus have been scoped out of the assessment.

LERC provided 130 records for hedgehog between 1977 and 2015. However, these records related to a wider search area based on the original survey extent of the ecological walkover in 2016. Habitats throughout the Scheme extent comprise coastal reed and grassland, with wider terrestrial habitats comprising of managed grassland and hedgerows. There are few features (brush piles / leaf accumulations) that would provide hibernation opportunities for hedgehog, therefore hedgehog is considered unlikely due to an absence of mosaic habitats. The presence of hedgehogs is considered low and are therefore of less than local importance and scoped out of the assessment.

5.4.4 Evolution of the baseline without the Scheme

The breach is predicted to naturally occur, with or without the Scheme. Without the Scheme the breach is likely to extend over a wide extent (unknown extent), possibly traversing south of Sluice Road (A1077). The effects of the breach in terms of habitat change relate to saturation of the existing drain network and the flooding of fields, which in the longer term would become increasingly colonised by aquatic vegetation, primarily reed bed habitat, as is typical of the more wetted areas within the existing landscape. Section 9.4.7 provides further detail on the likely geomorphological changes associated with a breach.

5.5 Likely significant effects

5.5.1 During construction

In the absence of mitigation, impacts on important ecological features are likely as a result of the construction works (considered in this chapter to include enabling works). Possible impacts are listed below, with Table 5.9 detailing the full assessment of impacts on ecological features.

- Vegetation, ground clearance and soil stripping, resulting in temporary and permanent habitat loss, together with loss and changes to plant assemblages
- Physical damage and fragmentation to notable habitats, i.e. reduction of plant diversity
- Severance of habitat connectivity, resulting in species isolation and risk of local extinctions
- Movement of construction vehicles on and off site, resulting in a heightened risk of biosecurity; increased risk of invasive plant species colonisation
- Accidental pollution and sediment release into drains and the River Ancholme resulting in downstream / coastal pollution incidents to flora
- Disturbance of individuals or groups of animals

- Direct injury or mortality of individual animals and plants
- Impacts from water level changes (a cause of habitat loss, degradation and/or injury/mortality to species)

Designated sites

During construction there will be direct permanent habitat loss of approximately 0.83 ha associated with the Humber Estuary Ramsar, SAC, SPA and SSSI (see Table 5.8). The affected habitat is located on the existing embankment at the western frontage, comprising of mown semi-improved grassland. Habitat loss is due to the proposed raising and widening of the existing embankment.

This 555m 'hold the line' section has the potential to cause permanent habitat changes in the SAC, SPA, Ramsar site and SSSI from the potential habitat changes from the continued presence of flood embankments affecting these habitats as the sea rises (termed as 'coastal squeeze').

The HRA identified the potential for likely significant effects on the SPA and Ramsar bird species from temporary disturbance (noise and visual) during the construction works.

No habitat loss of non-statutory designations will occur, although effects could arise from indirect impacts, i.e. pollution runoff.

Habitats

The permanent loss of habitats during the Scheme's construction phase, without consideration of mitigation equates to 7.3 ha and for temporary loss the total area equates to 29.96 ha. Temporary habitat loss is currently assessed on a worst-case scenario, as the required extent of the working area is to be refined. The temporary working area will be required to complete construction of the embankment and provision for site compounds.

Table 5.8: Permanent and temporary loss of habitats during construction (without mitigation)

Habitat / Feature	Permanent loss (ha or length)	Temporary loss (ha or length)
Humber Estuary Ramsar, SAC, SPA & SSSI	0.38 ha	1.22 ha
Poor semi-improved grassland	3.8 ha	11.35 ha
Marshy grassland	0.2 ha	0.36 ha
Neutral grassland – semi-improved	1.3 ha	1.46 ha
Tall ruderal	0.2 ha	0.64 ha
Amenity grassland	0.2 ha	1.95 ha
Improved grassland	0.7 ha	3.89 ha

Habitat / Feature	Permanent loss (ha or length)	Temporary loss (ha or length)
Arable	0.5 ha	4.33 ha
Marginal & Inundated vegetation (reedbed)	0.3 ha	1.71 ha
Broadleaved woodland plantation	0.1 ha	0.26 ha
Hedgerows	45 m	Defunct hedge - species-poor (363m) + Intact hedge - species-poor (986m)
Total (ha)	7.3 ha	29.96 ha
Total (m)	45 m	1,349 m

Protected Fauna

Construction activities that could directly and indirectly affect protected species include the following:

- Movement of construction vehicles, with the risk of injury and direct mortality;
- Excavations, resulting in mammals becoming trapped;
- General construction, noise, vibrations, movement of machines and dust pollution, affecting the breeding and feeding success of faunal species and their regular patterns of movement;
- Light pollution during night time works resulting in effects on bat flight patterns; and
- Habitat loss or fragmentation leading to reduce faunal breeding success and potential population reductions.

Based on the survey findings, species potentially affected during construction include SPA bird species, breeding birds throughout terrestrial habitat, barn owls, water voles, GCN and reptiles. Construction effects are detailed in Table 5.9.

Table 5.9: Assessment of effects on habitats and fauna during construction (pre-mitigation)

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
Humber Estuary Ramsar	International	<p>Criterion 1 Near-natural estuary:</p> <ul style="list-style-type: none"> ▪ Physical permanent damage to semi-improved neutral grassland (0.83ha) from raising / widening approximately 555m of existing embankment. ▪ Physical temporary damage to semi-improved neutral grassland (1.22ha) within the working footprint from proposed earthworks, regrading, and vegetation clearance. 	<p>Direct, negative, permanent loss of non-functional Ramsar habitat (semi-improved grassland) but no loss of functional habitat. Therefore, no impact on the integrity of the site.</p> <p>Direct, negative, temporary loss of non-functional Ramsar habitat (although reversible) (semi-improved grassland) but no loss of functional habitat. Therefore, no impact on the integrity of the site.</p>	<p>Not significant.</p> <p>Not significant.</p>
		<p>Criterion 5: Coastal and Estuarine bird assemblages of international importance and Criterion 6: Species/populations occurring at levels of international importance:</p> <ul style="list-style-type: none"> ▪ Disturbance (from visual noise and lighting stimuli) generated from the presence of construction works, plant and personnel to raise and widen approximately 555m of western embankment and install the western-most floodgate. ▪ Potential changes in water chemistry or turbidity from potential pollution or discharges from construction works. 	<p>Direct, temporary (short-medium duration) disturbance of estuarine birds, potentially displacing established bird feeding patterns, causing species to seek alternative locations to source food and changing the distribution of the qualifying features within the site. Greatest potential effects considered to be on avocet (present in very high numbers during late summer/autumn) and the waterbird assemblage</p>	<p>Significant (probable) at International level.</p>

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		<ul style="list-style-type: none"> Physical permanent damage to semi-improved neutral grassland (approx. 0.83ha) from raising / widening approximately 555m of existing embankment. Physical temporary damage to semi-improved neutral grassland (approx. 1.22ha) within the working footprint from proposed earthworks, regrading, and vegetation clearance. 	<p>during winter when harder periods of weather and associated issues on energy budget.</p> <p>No effect as works will be outside the water environment and standard good working practices will remove potential pollution pathways.</p> <p>Effects from soil movement (i.e.) sedimentation may smoother feeding areas.</p> <p>Direct, negative, permanent loss of non-functional Ramsar habitat (semi-improved grassland) which is not used by significant numbers of Ramsar species. Therefore, no impact on the integrity of the site.</p>	<p>Not significant.</p> <p>Not significant.</p> <p>Not significant.</p>
		Overall significance		Not significant for habitats, although for bird disturbance, significant at International level
Humber Estuary SAC	International	<p>Estuarine and intertidal habitats (estuaries)</p> <ul style="list-style-type: none"> Potential changes in water chemistry or turbidity from potential pollution or discharges from construction works. 	<p>No effect as works will be outside the water environment and standard good working practices will remove potential pollution pathways.</p>	<p>Not significant.</p>

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		<ul style="list-style-type: none"> Physical permanent damage to semi-improved neutral grassland (approx. 0.83ha) from raising / widening approximately 555m of existing embankment. Physical temporary damage to habitats (approx. 1.22ha) within the working footprint from proposed earthworks, regrading, and vegetation clearance of non-typical SAC habitat (semi-improved grassland). 	<p>Direct, negative, permanent loss of non-functional SAC habitat (semi-improved grassland) but no loss of functional habitat. Therefore, no impact on the integrity of the site.</p> <p>Direct, negative, temporary loss of non-functional SAC habitat (although reversible) (semi-improved grassland) but no loss of functional habitat. Therefore, no impact on the integrity of the site.</p>	<p>Not significant.</p> <p>Not significant.</p>
		Overall significance		Not significant
Humber Estuary SPA (birds of lowland freshwaters & their margins; and of estuarine habitats)	International	<p>Article 4.1 species: avocet, bittern, hen harrier, golden plover, bar-tailed godwit, ruff, bittern, marsh harrier, little tern;</p> <p>Article 4.2 species: shelduck, knot, dunlin, black-tailed godwit, redshank, knot; and</p> <p>The waterbird assemblage.</p> <ul style="list-style-type: none"> Disturbance (from visual noise and lighting stimuli) generated from the presence of construction works, plant and personnel to raise and widen approximately 555m of western embankment and install the western-most floodgate. Physical permanent damage to semi-improved neutral grassland (approx. 	<p>Direct, temporary (short-medium duration) disturbance of estuarine birds, potentially displacing established bird feeding patterns, causing species to seek alternative locations to source food and changing the distribution of the qualifying features within the site.</p> <p>Greatest potential effects considered to be on avocet (present in very high numbers during late</p>	Significant (probable) at International level.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		<p>0.83ha) from raising / widening approximately 555m of existing embankment.</p> <ul style="list-style-type: none"> Physical temporary damage to semi-improved neutral grassland (approx. 1.22ha) within the working footprint from proposed earthworks, regrading, and vegetation clearance. 	<p>summer/autumn) and the waterbird assemblage during winter when harder periods of weather and associated issues on energy budget.</p> <p>Direct, negative, permanent loss of non-functional SPA habitat (semi-improved grassland) which is not used by significant numbers of SPA species. Therefore, no impact on the integrity of the site.</p> <p>Direct, negative, temporary loss of non-functional SPA habitat (although reversible) (semi-improved grassland) which is not used by significant numbers of SPA species. Therefore, no impact on the integrity of the site.</p>	<p>Not significant.</p> <p>Not significant.</p>
		Overall significance		Significant negative at International level due to disturbance from visual noise and lighting stimuli.
Humber Estuary SSSI	National	<p>Component estuary habitats include intertidal mudflats and sandflats, coastal saltmarsh, saline lagoons, sand dunes and standing waters.</p> <ul style="list-style-type: none"> Physical permanent damage to semi-improved neutral grassland (approx. 0.83ha) from raising / widening approximately 555m of existing embankment. 	<p>Direct, negative, permanent loss of non-functional SSSI habitat (semi-improved</p>	<p>Not significant.</p>

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		<ul style="list-style-type: none"> Physical temporary damage to semi-improved neutral grassland (approx. 1.22ha) within the working footprint from proposed earthworks, regrading, and vegetation clearance. <p>Estuarine birds: Disturbance (from visual noise and lighting stimuli) generated from the presence of construction works, plant and personnel to raise and widen approximately 555m of western embankment and install the western-most floodgate.</p> <p>Breeding birds addressed below.</p>	<p>grassland) but no loss of functional habitat. Therefore, no impact on the integrity of the site.</p> <p>Direct, negative, temporary loss of non-functional SSSI habitat (although reversible) (semi-improved grassland) but no loss of functional habitat. Therefore, no impact on the integrity of the site.</p> <p>Direct, temporary (short-medium duration) disturbance of estuarine birds, potentially displacing established bird feeding patterns, causing species to seek alternative locations to source food and changing the distribution of the qualifying features within the site.</p>	<p>Not significant.</p> <p>Significant (probable) at national scale.</p>
		Overall significance		Not significant for habitats, although for bird disturbance, significant at a National level
Manor House Farm LWS	Local	Degradation through pollution, caused by run-off, silt and pollutants whilst undertaking works	Temporary (short term), reversible, low magnitude, effecting exiting hydrology / plant composition of the LWS.	Not significant (unlikely) at local level.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		to construction the embankment at Fulseas Drain, which has hydrological links to the LWS.		
River Ancholme LWS	Local	Degradation through pollution, caused by silt run-off and pollutants associated with defence works at Ferriby Sluice – new walls, ground re-grading and new embankment adjacent to the river.	Temporary (short term), reversible effect, resulting in changes to existing water chemistry.	Not significant (possible) at local level.
Semi-natural habitats (grasslands combined)	Local	Habitat loss (6.2ha) of species poor grassland to the north of Sluice Road and grassland to the west of CEMEX. This loss is associated with the working extent required for machinery to construct the embankment.	Temporary (short term) loss of plant species that is reversible and of low magnitude.	Not significant (certain) at less than local level.
Hedgerows & Trees	Local	Permanent loss of 45m of 3 species poor hedgerows to the north of Sluice Road.	Permanent, direct negative, due to loss of habitat connectivity and structural diversity.	Significant (probable) at local level.
		Permanent or partial loss of 79 trees due to required working extent to construct the new embankment.	Permanent, direct negative, reversible of trees as integral landscape feature and habitat.	Significant (probable) at local level.
Open water and Drains	Local	Possible partial loss of Pond 29 edge habitat (reeds) and partial loss of Fulseas Drain (30m) (3b) due to construction of new embankment.	Permanent, direct negative effect resulting in loss of aquatic flora and local biodiversity.	Significant (probable) at local level.
		Degradation through pollution, caused by run-off, silt & pollutants (P21 west of CEMEX). Drains are a hydrological pathway for pollution,	Temporary (short term), reversible, low magnitude resulting effect of decline in floristic diversity and degradation of local biodiversity.	Not significant (probable).

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		therefore potential effects on drains in wider context.		
		Overall significance for habitats		Significant at the local level
Bats (Ferriby sluice bat roost)	County	Potential disturbance, loss of bat roost, killing & injury of bats during active bat season, (March – September). This relates to works at Ferriby Sluice – raising of the existing demountable defences and installation of flood walls; movement / vibrations from construction vehicles and other machinery required to carry out the works.	Permanent direct negative, irreversible effect upon a maternity daubenton bat roost: reduction in breeding success and decline / extinction of local population.	Significant (possible during active bat season).
Bats (commuting / foraging habitat)	Local	Loss / severance of commuting & foraging habitat (hedgerows and shrubs), which will have been partially lost to construct the embankment.	Temporary negative medium effect, resulting in displacement, associated with reduced habitat / food availability and causing bats to seek alternative habitat.	Significant (probable) at local level.
		Disturbance during commuting and foraging through increased light and activity levels at night, largely associated with site compounds, with security lighting and generators.	Temporary negative effect over a medium duration that may cause bat displacement, with individuals seeking alternative areas to forage.	Significant (probable) at local level.
		Mortality with construction vehicles where works / movement of machines proceed during periods of high bat activity (dusk and dawn).	Permanent, direct negative, irreversible.	Significant (possible) at local level.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		Overall significance - bats		Significant at local level
Water vole	Local	Injury / killing of water vole whilst occupying burrows / nest sites at Fulseas Drain (drain 3b). Impact caused by operating machines to excavate of Fulseas Drain for construction of the new embankment.	Permanent, direct negative with an irreversible effect upon the local water vole population, causing a decline of numbers.	Significant (certain) at local level.
		Severance of commuting / feeding habitat. Drain 1a and 1b will be isolated from 3b.	Permanent, direct negative, irreversible effect on the viability of the water vole population.	Significant (certain) at local level.
		Displacement from habitat disturbance / fragmentation, increasing risk of predation from mink.	Permanent, direct negative, effect on the viability of the water vole population.	Significant (probable) at local level.
		Overall significance		Significant at local level.
Otter	Local	Loss of potential foraging opportunities due to part removal of Pond 29 (edge habitat), which supports aquatic fauna frequented by otter for feeding.	Direct, negative, permanent (up to medium-term) loss, although minor impact due to P29 aquatic zone being retained. Feeding patterns not likely to be affected.	Not-significant.
		Degradation of water quality (River Ancholme) through proposed works close to Ferriby Sluice, resulting in pollution & subsequent reduction in food resources for otter.	Indirect, temporary (short-medium duration) that could reduce the availability of food for otters. The effect is reversible and unlikely due to best working practice employed during the works.	Not-significant.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		Disturbance during construction via noise, vibrations and lighting during periods when otter are active (during the night and dawn).	Indirect, temporary (short-medium duration), reversible effect that is likely to cause displacement of regular otter commuting and foraging behaviour.	Significant (probable) at local level.
		Direct injury and / or mortality of otters resulting from the movement of machines during night time working, or early dawn when otters are most active.	Direct, negative, permanent injury and killing of individual otters and wider effect on the successful breeding of the local population.	Significant (possible) at local level.
		Overall significance		Significant for potential disturbance, injury or killing of otter during active periods.
Breeding birds, include SSSI species (species associated with the Humber Estuary SPA are dealt with above)	Local	The proposed working footprint to construct the new embankment will result in the removal of vegetation, including hedgerows, trees and reedbed habitat associated with drains.	Direct negative over short-medium term, resulting in injury and killing of birds during the breeding season (March to August, inclusive).	Significant (certain) at local level.
		Permanent habitat loss (7.3ha) from site clearance, resulting in reduction of nesting, shelter and feeding opportunities. Temporary loss (29.96ha) to accommodate working area (worst case scenario).	Permanent / temporary loss without mitigation will have a direct negative effect upon local breeding populations over long-term.	Significant (certain) at local level.
		Overall significance		Significant effect at the local level.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
Barn owl	Local	Disturbance of barn owls within 180 of the works whilst occupying nest box (B1) between March – August, inclusive. Disturbance will occur during the enabling and the main construction period from the movement / noise of machines and the increased volume and movement of contractors on site.	Indirect negative, temporary (up to medium term), resulting in adults to vacate nates, unsuccessful rearing of chicks and subsequent reduction in the local barn owl population.	Significant (probable) at local level.
		Disturbance and displacement of barn owl commuting and foraging behaviour: due to movement of construction vehicles, presence of contractors and activity associated with site compounds, including increased lighting during the night at compounds.	Indirect negative, temporary (up to medium term) effect, causing displacement of barn owls from their frequented foraging habitat and reduction of food to take back to young chicks.	Significant (probable) at local level.
		Overall significance		Significant effect at the local level.
Great crested newts (assumed population in Pond 43)	Local	Indirect impacts from water level changes in wider area (Manor House Farm LWS) from construction of the new embankment and creation of a new surface water drain at embankment toe.	Indirect, negative effect of low magnitude causing a reduction of available aquatic habitat. Unlikely impact.	Not-significant
		Injury / killing during construction of the embankment to the north of Sluice Road.	Direct, negative, although very low risk due to absence of GCN from survey and dispersal barriers (Sluice Road). Low risk of GCN being present in terrestrial habitat of working area.	Significant (unlikely) at local level.
		Overall significance		Significant at the local level.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
Reptiles (assumed population of grass snake)	Local	Injury and killing of grass snake due to the movement of machines within the proposed working area for construction of the embankment.	Direct, negative resulting in reduction of the local grass snake population.	Significant (possible) at local level.
		Disturbance and displacement during vegetation clearance and throughout construction, caused by habitat loss.	Direct, negative due to loss of potential basking and foraging habitat. The effect is temporary (up to medium-term) that is reversible and of a low magnitude.	Significant (possible) at local level.
		Overall significance		Significant effect at the local level.
Fish	Local	Pollution incidents and increased silt deposition resulting in works at Ferriby Sluice and due to regrading works adjacent to the Humber Estuary SAC.	indirect, negative, reversible, temporary (up to short and medium-term) effect causing a decline in fish breeding success.	Not significant (probable).
Invertebrates (Pond 29)	Local	Killing and loss of local invertebrate populations from loss of habitats and pollution events, i.e. silt runoff.	Direct negative, effects resulting in loss of local invertebrate populations.	Significant (probable) at local level.

5.5.2 Operational phase

The potential intertidal habitat loss/change from coastal squeeze effects from the continued presence of flood embankments in the western part of the proposal (preventing the migration of intertidal habitats inland as sea level rises) is assessed in the Humber Flood Risk Management Strategy Habitats Regulations Assessment (Final version, February 2011) and addressed by the Strategy's programme of habitat creation sites. As there are no additional adverse effects from this proposal, the effects are not assessed here further. Indeed, the inclusion of set-back defences in these proposals may help promote more natural coastal processes and reduce coastal squeeze effects compared with the existing condition.

The following impacts may arise during operation of the Scheme:

- Modification of land use, resulting in reduction and floristic species / structural change of existing habitat character;
- Habitat reinstatement and risk of non-successful establishment;
- Habitat management of planted species, resulting in disturbance to species; i.e. breeding birds; and
- Biosecurity risk of introducing invasive species and biological pathogens during management of planted species.

Table 5.11 assesses the effects upon ecological features during the Scheme's operation phase.

Table 5.11: Assessment of effects on habitats and fauna during the operational phase of the Scheme.

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
Humber Estuary Ramsar site	International	<p>Criterion 1 Near-natural estuary:</p> <ul style="list-style-type: none"> ▪ Potential habitat loss/change from habitat reinstatement or management works. ▪ Potential to support the integrity of the estuarine habitat should a natural breach of the existing eastern embankment occur. <p>Criterion 5: Coastal and Estuarine bird assemblages of international importance and Criterion 6: Species/populations occurring at levels of international importance:</p> <ul style="list-style-type: none"> ▪ Disturbance (from visual and noise stimuli) during habitat reinstatement or management works. ▪ Potential habitat loss/change from habitat reinstatement or management works. 	<p>None, works will not affect functional habitat in the designation or the key habitats of the qualifying species.</p> <p>Beneficial long term because the new eastern embankment will be set back, potentially promoting more natural coastal processes, reducing coastal squeeze effects compared with the existing condition, and providing an increased extent of potential estuarine habitat (approx. 10ha) should a natural breach of the existing embankment occur.</p> <p>Negligible temporary adverse effects from operations as they are small in scale.</p> <p>None, works will not affect functional habitat in the designation or the key habitats of the qualifying species.</p> <p>Beneficial long term because the new eastern embankment will be set back, potentially promoting more natural coastal processes, reducing coastal squeeze effects compared with the existing condition, and providing an increased extent of potential estuarine habitat</p>	<p>Not-significant</p> <p>Beneficial significance</p> <p>Not significant</p>

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		<ul style="list-style-type: none"> Potential to support the integrity of the estuarine habitat should a natural breach of the existing eastern embankment occur. 	(approx. 10ha) should a natural breach of the existing embankment occur.	
Humber Estuary SAC	International	<p>Estuarine and intertidal habitats (estuaries)</p> <ul style="list-style-type: none"> Potential habitat loss/change from habitat reinstatement or management works. Potential to support the integrity of the estuarine habitat should a natural breach of the existing eastern embankment occur. 	<p>None, works will not affect functional habitat in the designation or the key habitats of the qualifying species.</p> <p>Beneficial long term because the new eastern embankment will be set back, potentially promoting more natural coastal processes, reducing coastal squeeze effects compared with the existing condition, and providing an increased extent of potential estuarine habitat (approx. 10ha) should a natural breach of the existing embankment occur.</p>	Not-significant
Humber Estuary SPA (birds of lowland freshwaters & their margins, and of estuarine habitats)	International	<p>Article 4.1 species: avocet, bittern, hen harrier, golden plover, bar-tailed godwit, ruff, bittern, marsh harrier, little tern; Article 4.2 species: shelduck, knot, dunlin, black-tailed godwit, redshank, knot; and The waterbird assemblage</p> <ul style="list-style-type: none"> Disturbance (from visual and noise stimuli) during habitat reinstatement or management works. 	<p>Negligible temporary adverse effects from operations as they are small in scale.</p> <p>None, works will not affect functional habitat in the designation or the key habitats of the qualifying species.</p> <p>Beneficial long term because the new eastern embankment will be set back, potentially promoting more natural coastal processes, reducing coastal squeeze effects compared with the existing condition, and providing an increased</p>	Not-significant

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		<ul style="list-style-type: none"> ▪ Potential habitat loss/change from habitat reinstatement or management works. ▪ Potential to support the integrity of the estuarine habitat should a natural breach of the existing eastern embankment occur. 	extent of potential estuarine habitat (approx. 10ha) should a natural breach of the existing embankment occur.	
Humber Estuary SSSI	National	<p>Component estuary habitats: intertidal mudflats and sandflats, coastal saltmarsh, saline lagoons, sand dunes and standing waters</p> <ul style="list-style-type: none"> ▪ Potential habitat loss/change from habitat reinstatement or management works. ▪ Potential to support the integrity of estuarine habitats should a natural breach of the existing eastern embankment occur. 	<p>None, works will not affect functional habitat in the designation.</p> <p>Beneficial long term because the new eastern embankment will be set back, potentially promoting more natural coastal processes, reducing coastal squeeze effects compared with the existing condition, and providing an increased extent of potential estuarine habitat (approx. 10ha) should a natural breach of the existing embankment occur.</p>	No-significant
Manor House Farm LWS	Local	No impact predicted, as no management prescribed.	Neutral as no effects arising from no requirement to undertake management works.	Neutral
River Ancholme LWS	Local	No impact predicted as no post management of the river.	Neutral as no effects arising from no requirement to undertake management works.	Neutral

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
Semi-natural habitats (grasslands combined)	Local	Failure of successful establishment of plant species on new embankment, due to colonisation of non-desirable species.	Direct negative, long term due to the presence of less favourable species, i.e. domain tall herbs such as common thistle.	Significant
		Colonisation of invasive plant species.	Indirect negative, long term as will out compete native species.	Significant
Hedgerows & Trees	Local	Failure of successful establishment.	Direct negative, long term as reduces habitat diversity.	Significant
Open water and Drains	Local	Colonisation of invasive and non-desirable species.	Indirect negative, long term as will out compete native species.	Significant
Bats (Ferryby sluice bat roost)	Regional / District	No disturbance beyond normal operation of Ferryby Sluice.	No resulting effects.	Not-significant
Bats (commuting / foraging habitat)	Local	Increased extent of new habitat for bat foraging due to new planting proposals and recovering of temporary habitats lost during construction.	Direct beneficial, medium to long term. The local bat population will be able to re-establish commuting and foraging throughout the landscape.	Neutral
Water vole	Local	Heightened risk of predation from mink as water vole adapt to new environment, including a new surface water drain at the toe of the new embankment, which will be connected to Fulseas Drain.	Direct negative, short, medium and long-term effect of the survival of the local water vole population.	Significant

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
		Absence of habitat management, resulting in drain to become overgrown and unfavourable for water vole.	Direct negative, long term effect due to a reduction of available plant for water vole to feed on.	
Otter	Local	No impact predicted as the management will no impact on the core habitat used by otters, i.e. River Ancholme.	No resulting effects upon the functionality of the otter population.	No-significant
Breeding birds	Local	Establishment of new habitat for bird nesting and foraging.	Direct beneficial, medium to long term effect enabling birds to utilise new habitats as they establish.	neutral
Barn owl	Local	<p>Increased extent of habitat for barn owl foraging due to the new embankment being set back, with new available grassland to the north of the embankment.</p> <p>Barn owl box B1 will be re-opened, resulting in an additional nest site.</p>	<p>Direct beneficial, medium to long term effect as recovering and establishment of habitats will benefit the local small mammal population, which is an important food source for barn owls.</p> <p>Positive long-term effect on the local barn owl population as there is a new next box that will be available for potential breeding.</p>	Positive significance
Great crested newts (assumed population in Pond 43)	Local	No impact predicted as there will be no management that will impact on Pond 43.	No resulting effects.	Neutral

Feature	Value	Type of Impact	Characterisation of effect	Significance of Effect on Conservation Status / Site Integrity (Pre-Mitigation)
Reptiles (assumed population of grass snake)	Local	Increased extent of habitat to exploit for commuting, feeding and hibernation. This is due to a recovery of habitats during operation.	Direct beneficial, medium to long term effect as grass snake will be able to access existing recovering habitats and new habitat on the new embankment for basking.	Positive significance
Fish	Local	No impact identified.	No resulting effects.	Neutral
Invertebrates (Pond 29)	Local	No impact predicted, establishment of habitats during operation will not cause loss of invertebrate populations.	Direct beneficial, medium to long term effect as invertebrates will be able to continue with their breeding cycles.	Positive significance

5.6 Mitigation

5.6.1 General measures

Mitigation for the proposed scheme is included in the Environmental Action Plan (EAP) (Appendix 1.2). The EAP references general best working environmental practice, wildlife licensing and non-licensed species-specific Precautionary Working Method Statements (PWMS). The EAP also specifies the timescales of the mitigation to put in place for the Scheme. The EAP will be used as a basis to prepare a Construction Environmental Management Plan (CEMP) which will give further details on the implementation of mitigation.

The general measures bulleted below reflect best environmental practice to be adopted throughout the duration of the Scheme, including the enabling works.

Throughout the construction phase, appointment of an Environmental Clerk of Works (ECoW) will be required. The ECoW will be involved in the delivery of Tool Box talks, auditing environmental working practice and approved mitigation.

General best working environmental practice includes:

- Site compounds or mobile construction machines to be positioned outside of ecological sensitive areas, such as the Humber Estuary SPA and SAC;
- Contractors to use existing access tracks, roads and haul roads as far as possible, and decompaction measures to be implemented, where appropriate. The widening of access tracks should not extend into important habitats;
- No additional habitats beyond what has already been approved for the Scheme should be removed or modified;
- Information sheets and / or posters are to be placed in site compounds to ensure contractors are regularly familiarised with the Scheme's ecology;
- An audit trail and all relevant ecological constraints and mitigation plans will be provided to the ECoW;
- Unless specified for ecological enhancement, all cut vegetation will be chipped and removed from site;
- No holes or trenches are to be left uncovered overnight, as animals can become trapped and consequently die from starvation, drowning, or predation from larger mammals. All small and larger trenches and holes are to be securely covered, with consideration given to small mammals, i.e. hedgehog; and
- It is assumed best practice will be adopted when working on or near a watercourse, and that management of noise, dust and vibration will be applied to the enabling works and throughout construction.

5.6.2 Designated sites

The HRA details the mitigation required to avoid adverse effects on the integrity of the Humber Estuary Ramsar, SAC and SPA. Key measures focus on minimising disturbance of waterbirds at key estuarine habitats and sensitive times year.

These mitigation measures, along with any additional measures to protect the SSSI, are as follows:

- Widen/raise the embankments onto the back of the landward-side of the existing embankment.

- Reinstatement the banks and replace lost habitat, including the ditches and ponds on the landward side of the bank, reseeding the banks and replacing trees/scrub vegetation.
- Locate temporary access tracks and site compounds landward of the existing embankment.
- Minimise access to the estuarine side of the bank by plant and personnel as much as possible (although some regrading of the bank on the estuarine side will be needed in places, this will be done from the bank top).
- Implement standard site mitigation to minimise the risk of pollution/silt entering the land, water and air.
- Clear the vegetation within the working area outside of bird nesting season, which falls from March to August, inclusive. This is to reduce the risk of nests in the working area and potential disturbance effects.
- Avoid embankment raising/widening works to the west of the Ancholme and the western-most demountable defence (section north of A1077) works between November and February (inclusive) to minimise disturbance of overwintering populations of waterfowl and waders.
- Avoid embankment raising/widening works west of the Ancholme and the western-most demountable defence (section north of A1077) works for two hours either side of low tide during July, August, September and October.
- Reduce potential cumulative disturbance effects by programming works to not be drawn out over many years (i.e. >3 years).
- Undertake monitoring during construction, targeted at key SPA/Ramsar species to record behavioural responses and efficacy of mitigation. The frequency of monitoring is to be adjusted to bird sensitivity over the tide cycle. The bird monitoring plan will be agreed in advance with Natural England.

Further details of the above mitigation measures are detailed in the HRA (Appendix 5.3).

5.6.3 Habitats

The reinstatement and creation of habitats is shown on the 'Landscape and Ecology Outline Design General Arrangement Plans' (Figure 6.3). Habitat reinstatement seeks to integrate mosaic habitats in keeping with landscape character and for biodiversity gain opportunities through furthering targets of the UK and Local Biodiversity Action Plans and habitats of principal importance.

Habitat reinstatement and creation forms part of the Scheme design, comprising reseeding and planting, and will commence immediately after phased completion of engineering works, i.e. where a section of embankment has been profiled to the finished level, this area of embankment will be reseeded prior to moving onto the next section of embankment construction. Where practical, following construction, all habitats will be restored to the condition they were in before construction or will be left in a condition which will allow their recovery over time, by replanting the existing species and habitats based on data from the Phase 1 Habitat survey.

The Landscape and Ecology Mitigation Plan will be accompanied by a Landscape Specification, which will include the following:

- A programme for habitat reinstatement and creation in relation to the construction programme;
- Methods for ground preparation, soil management and profiling of local topography;
- Seed mix requirements to reflect local character;

- Methods for seed application (i.e. hydro seeding) and planting of shrubs and trees;
- Measures required for monitoring habitat establishment and re-planting measures where required;
- Management of potential colonisation of invasive and non-desirable plant species.;
- A programme for habitat management (i.e. desired cutting regimes) and monitoring of habitat establishment; and
- Approach to sympathetic pruning and replacement of non-successful establishment of shrubs and trees.

5.6.4 Biosecurity

Due to the length of the proposed scheme and the sensitive location relative to the Humber Estuary Ramsar, SAC and SPA, preventing the introduction or spread of invasive species is critically important. Measures for biosecurity management during construction will need integrating with the CEMP. General biosecurity principles include:

- To ensure vehicles are cleaned regularly to remove any accumulated mud, especially from wheels and wheel arches.
- To ensure tools are cleaned on a daily basis to reduce the risk of transporting plant fragments and soil between different sections of the site and considered transporting tool to other development sites.
- To keep vehicular access to a minimum by not entering areas unnecessarily and, where practicable, keep to established hard tracks.
- Maintenance of Personal Protective Clothing, i.e. cleaning footwear at the beginning and end of a work day.

Guidance on environmental biosecurity is delivered through the GB non-native species secretariat: Defra, 2008. 'The Invasive Non-Native Species Framework Strategy for Great Britain'.

5.6.5 Protected species

All elements of the Scheme will incorporate appropriate mitigation measures specific to protected species, as summarised below.

Bats

The flood wall alignment at Ferriby Sluice has been designed to avoid disturbing the daubenton maternity roost, which will be active during spring and summer, from March to September, inclusive. Therefore, works are planned between October-February, inclusive, to ensure welfare of bats are not compromised. Where works deviate from this planned working period, a Natural England disturbance licence is likely, although this will depend on the distance and specification of the works.

October will provide an ideal time to complete works at Ferriby Sluice works, as this timing will not conflict with best practice working measures in respect of SPA bird species.

Water vole

A Water Vole Mitigation Strategy (Appendix 5.2) has been prepared to described methods for water vole displacement at Fulseas Drain (3b) and connected drains 1a and 1b. The proposed mitigation has been designed in accordance with the 'The Water Vole Mitigation Handbook – The Mammal Society Mitigation Guidance Series' (Strachan et al, 2016).

The Environment Agency hold a Natural England Organisational Licence (WML-OR23), which, for the purpose of flood alleviation and drainage works, allows for 'Disturbance of water vole in their burrows and damage to water vole burrows by displacement'. Under the conditions of the licence, works are permitted for up to 150m of a given watercourse.

It is important to note that the initial vegetation removal for water vole displacement will need to be completed between 15th February – 15th April 2019. However, where low winter night time temperatures persist (below 5°C), displacement should be delayed until the temperatures are generally greater than 5°C as prolonged periods of cold weather will reduce the likelihood of water voles moving by displacement. Operations should also be delayed if there is frost and snow on the ground. Displacement of animals will need to be completed by the 15th April 2019. This is because the water vole breeding season extends from the 16th April until 14th September. The second window between 15th September and 31st October can be relied upon if required, although this should be avoided as the water vole population will be at its largest at a time when available resources are lower, thus risks are higher.

An overview of the displacement method is summarised below, with the full detailed methods presented in the Water Vole Mitigation Strategy (Appendix 5.2). Figure 5.4 (Appendix 1.1) shows the location for where water vole has been confirmed as present and where mitigation will be implemented.

Method for water vole displacement

- Prior to displacement works, habitat enhancement will need completing for the first 100m section of the receptor Drain D3. This will involve cutting back a hedgerow on the western side of the drain, strimming the embankment and planting reed sweet-grass, translocated from Fulseas Drain. This enhancement work will need to commence in January to allow vegetation to re-grow during the spring.
- Removal of vegetation (from 15th February 2019) on either side of Fulseas Drain, up to a distance of 70m, allowing for a 20m working area either side of the new embankment. The vegetation will be cut in two stages, initially cut 150 mm above ground level and then cut down to ground level. This two-stage cutting is required to reduce the risk of injuring or killing water voles. The cutting will be completed using either a hand-held strimmer or excavator with a flail attachment under the supervision of Additional Authorised Person(s) of the Environment Agency's Organisational Licence.
- In-channel vegetation (reed sweet-grass) will be translocated to the receptor Drain D3, including placing turf inside the culvert to encourage water vole to pass through the culvert.
- Once vegetation removal is complete, the Additional Authorised Person(s) of the Organisational Licence will mark out the location of all water vole burrows using canes, ensuring each burrow is given a unique reference number and its location recorded using a handheld Global Positioning System (GPS). Wildlife cameras will also be installed to supplement the monitoring of water vole activity.
- Water vole activity will be monitored using wildlife cameras and searching for field signs (latrines and feeding stations) for a minimum period of seven days to established if displacement has taken place. Where monitoring continues to find fresh water vole activity, the monitoring period may need to be extended.
- Once it is confirmed that water voles are successfully displaced, an exclusion fence will be installed to the southern extent of the works and works. If site conditions do not allow for an effective fence to be used, then a combination of earth bunds and or vegetation management will be used to make the area unsuitable for water vole for the duration of works. Following this works will proceed as soon as reasonably possible.
- Due to the loss of permanent habitat, each burrow will be carefully excavated, carefully searched and subsequently destroyed in advance of the main works at Fulseas Drain.

Where water voles are encountered, individuals must be allowed to escape to the receptor area.

Exclusion Barrier Fencing (Drain 10 and 37)

As water vole were confirmed as present in drains 10 and 37 (Figure 5.4) during the 2018 survey, protection measures will need to be put in place to avoid impacting the water vole population.

Mink control

Mink trapping will need to be undertaken prior to the displacement works; in December 2018 and January 2019, possibly leading into February 2019. The trapping will take place on Fulseas Drain and the receptor drain (D3), ideally 2 traps per drain (4 in total). Trap inspections will need to be completed daily to prevent unnecessary suffering of mink and to prevent accidental trapping of water voles.

The Design Engineer will need to ensure a suitably qualified person is appointed to undertake the trapping and disposal of mink.

Monitoring

In accordance with Natural England's licensing conditions, post water vole mitigation monitoring is required up to three years, or until it can be confirmed the water mitigation has been successful. Determining mitigation success involves surveying for burrows and water vole field evidence (feeding stations and latrines) within the receiving receptor site and any newly created / enhanced water features.

Habitat mitigation

Unless alternative mitigation is identified and agreed with appropriate parties, a new surface water ditch (Figure 5.4) will be designed specifically for water vole. It will be located on the south side of the new embankment, parallel and to the east of Fulseas Drain, for approximately 50m and directly connected to Fulseas Drain.

The ditch will be profiled to replicate Fulseas Drain (including depth) and will be seeded with a grassland mix. The ditch will be plug planted with reed sweet-grass to ensure habitat is immediately available for water vole.

The new ditch will be ready to receive water voles at the point the new embankment bund and works at drain 3b are complete.

Otter

No mitigation is prescribed for otter, as there are not otter holts or resting places within the Scheme's extent. However, prior to the start of construction and for any enabling works involving vegetation removal or earth works, pre-construction surveys for otter is required for Pond 29.

Where otter is confirmed as absent following pre-construction surveys, works can commence as planned. Where otter presence is identified, works will need to be put on hold at that location until the potential effects upon otter have been assessed by the ECoW.

Breeding Birds

All vegetation suitable for breeding birds (included warbler species listed on the SSSI) will be removed before the start of the works, outside of the bird breeding season (March – August, inclusive). Suitable breeding bird vegetation includes hedgerows, shrubs, trees, tall herbs,

bramble thickets and reed bed habitat present within drains and other water features (i.e. Pond 29).

To prevent injury or killing of small mammals and possible hibernating grass snake, vegetation will be cut to a height of 200 mm. Wood derived from felled shrubs or trees can be cut to 300 mm lengths and retained for proposed great crested newt habitat enhancement within Manor Farm LWS. All other surplus cut vegetation will need to be chipped and removed from site. No brush or reedbed piles are to be left within the construction working area.

If breeding birds, or nests (including the beginnings of nest) are found during the works, all work within 10 m of the nest must stop immediately and the ECoW consulted. The ECoW will carry out an inspection of the nest and may need to monitor over a period of 24 hours to establish if the nest is in active use. Where active use is confirmed, the nest will need to remain undisturbed until the fledglings have left the nest.

Estuarine Species

Mitigation for SPA/Ramsar bird species is addressed through the HRA, which is also applicable to the SSSI species. The key element of this mitigation, as shown on Figure 5.5 (Appendix 1.1), refers to avoiding disturbance on the western frontage close to SPA/Ramsar bird habitat. This mitigation includes works to avoid the winter period (November – February inclusive). In addition, during summer/autumn, the works are to also avoid two hours either side of low tide (July – October inclusive).

Barn Owl

A barn owl nest box with a possible active nest is located 80m from the Scheme's most eastern extent (Figure 5.6, Appendix 1.1). Nesting barn owls are protected between March and September, inclusive. Mitigation will involve temporary closure of the nest box from December to September, inclusive. This closure period takes into account early courtship behaviour during the winter months. Temporary closure of the barn owl box will require a new replacement nest box, which will need to be positioned at a distance of at least 170 m from the works.

The new barn owl box will be required to be installed in November or December 2018, and closure of the existing box during December 2018 or January 2019.

Great Crested Newt

As the works fall within 50m of Pond 43, mitigation has been developed to ensure the conservation status of GCN is not compromised. Due to the presence of a semi-permeable barrier (Sluice Road) and an absence of GCN in ponds to the north of the road, where the works are proposed, the potential to complete works in accordance with a GCN Low Impact Licence is being explored with NE's discretionary advice service. The Low Impact Licence will cover destructive fingertip searches between March to September, inclusive. This will apply to 0.73 ha of habitat within 100m of Pond 43, or as prescribed in the Low Impact Licence.

Under supervision of the ECoW, two artificial hibernation features will be placed at the base of a hedgerow within Manor House Farm Fields LWS. (Figure 5.7, Appendix 1.1). The hibernation features can be constructed from cut 300mm lengths of wood cleared during the winter. The size of hibernacula will be approximately 1m in length and 500mm tall.

Reptiles

A PWMS will be prepared to prevent potential injury and killing of grass snake. Figure 5.8, Appendix 1.1 shows the areas for where the PWMS applies, which includes a strip of grassland and reedbed habitat to the west of the CEMEX, a section of habitat to the west of Ferriby Sluice, reedbed and grassland on the seaward side of Ferriby Sluice and Pond 29. The key elements of the PWMS will include:

- The PWMS will be overseen by the ECoW
- During clearance of vegetation in winter, which includes the months of November to February, inclusive, vegetation will be cut to a height of 200mm above ground level. This is necessary to avoid impacting hibernating grass snake
- A second phase of cutting will be completed during the active reptile season, March to October, inclusive. Areas to be cut will first be inspected for the potential presence of grass snake, with any individuals observed encouraged to seek shelter away from the working area
- It may be necessary for the ECoW to relocate individual grass snakes to a suitable and safe habitat, away from the working area. The existing flood embankment provides a suitable location for relocating grass snake
- The ECoW will maintain a record of any grassland located and areas for where they have been relocated.

Fish

No specific mitigation is required for fish, sedimentation will be managed through best practice.

Invertebrates

No specific mitigation is planned for invertebrates as the semi-natural habitats are likely to support common and widespread species. As Pond 29 will be subject to partial removal, there will be habitat remaining that can be utilised by invertebrates. Retention of the existing embankment will also offer alternative suitable habitat for invertebrates.

5.6.6 Schedule of mitigation

The schedule for the mitigation is given in Table 5.12. This should be read in conjunction with species-specific mitigation figures, Appendix 5.2 and the Environmental Design General Arrangement Plans.

Table 5.12: Ecology Mitigation - Ecology Mitigation - Seasonal Constraints (red = no working, green = acceptable working period)

Species / Mitigation task	2018	2019												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
SPA/Ramsar Site														
Working period for raising/widening bank works to western frontage and demountable defence to avoid disturbance to SPA/Ramsar species. T = additional tidal constraint here – avoid works for two hours either side of low tide.									T	T	T	T		
Monitoring of target SPA/Ramsar species according to Monitoring Plan agreed with Natural England.														
Bats (works to be completed under Non-Licensed Method Statement)														
Works at Ferriby Sluice to be completed under a Bat Precautionary Working Method Statement.														
Water Vole (works to be completed between 15th February – 15th April 2019). Drain 3b is Fulseas Drain														
Mink trapping & disposal, completed by approved contractor.														
Start of displacement works under Natural England Organisational Licence (drain 3b): Cut vegetation in two stages (150 mm and then to ground). remove arisings			Cut vegetation by 15 th Feb											

Species / Mitigation task	2018	2019											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
from site. Translocate reed sweet-grass to receptor drain and at each end of the culvert at Sluice Road. Authorised person to mark out location of all water vole burrows).													
Drain 3b: Complete water drawdown and install exclusion fencing at northern extent of works (Ditch 3b / Fulseas Drain).			15/16 th Feb										
Monitor water vole displacement using cameras and field monitoring for 7 days. May need to extend by number of days.			17 th -24 rd Feb										
Complete destructive searches of burrows. Remove grass turf and store in suitable location for later reinstatement of new Surface Drain.			Start 24 th		Complete by 15 th								
Seed & plug plant new surface water drain.													
Post water vole inspections, one fortnightly and then monthly once ecologist has confirmed displacement water vole have established in receptor ditch. Ensure exclusion fence is maintained during construction.													
Otter													

Species / Mitigation task	2018	2019											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pre-construction surveys of working areas associated with ditches and Pond 29.													
Breeding Birds													
Vegetation removal to 200 mm above ground level. Remove all shrubs, hedgerows, low growing bramble, reedbed & tall herb habitat within scheme extent & working area, including compounds. Retain approximately 30 wood sections of 300 mm length for great crested newt habitat enhancement.	Nov / Dec												
Barn owl (works to be completed December 2018 and by mid-January 2019)													
Install new box on tree or set on pole	Mid Nov												
Close existing box (under guidance from appointed ecologist)	Mid Dec												
Re-open existing box on completion of works when at a distance of 180 m.													
Great Crested Newts													
Clearance of vegetation in accordance with Low Impact Licence Conditions.													
Creation of hibernacula and scrapes at Receptor Site. Use cut logs,													

Species / Mitigation task	2018	2019												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
approximately 300 mm length from trees / shrubs felled in winter.														
Reptiles (measures to be covered by a Precautionary Working Method Statement)														
Clearance of vegetation in winter to 200 m above ground level in winter.														
Second phase of vegetation clearance for grass snake displacement.														

5.7 Residual effects

Providing the proposed mitigation is put in place and within the specified time scales, no residual significant effects upon important faunal species are predicted. Similarly, providing habitats are reinstated relative to the phased works, there will be opportunity for habitat establishment / early recovery throughout the Schemes construction phase. There will be no loss of botanically rich habitats and reinstatement will be on a like for like basis. Taking into context mitigation for faunal species and biodiversity gain relative to habitats, no residual effects will result following construction or operation of the Scheme.

6. Landscape

6.1 Introduction

The Winteringham Ings to South Ferriby Flood Alleviation Scheme has the potential to give rise to significant landscape and visual effects. This Landscape and Visual Impact Assessment (LVIA):

- Describes the relevant legal and policy framework which has informed the undertaking of the assessment;
- Describes the methodology used for the identification and assessment of likely significant landscape and visual impacts effects;
- Describes the landscape and visual baseline having regard to existing information;
- Describes the mitigation measures that have been adopted as part of the Scheme;
- Identifies and assesses the potential residual effects that could result from the Scheme during construction and operation phases; and;
- Provides a summary of the residual effects for the mitigated Scheme.

Landscape character and visual impact assessments are separate, but related topics. The landscape character assessment relates to changes to the elements, features and patterns which together make up the landscape character as the receptor. The visual assessment relates to the change in the view from particular locations referred to as the visual receptors.

The process of LVIA involves developing an understanding of both the existing landscape and visual resources in relation to the Scheme, and then assessing the impact of the Scheme on these resources. Mitigation measures are proposed and included as part of the design where required.

The landscape character has been assessed through consideration of nationally and locally designated landscapes and their features, as well as site specific qualities.

An understanding of the visual impact has been developed by assessing the magnitude of the change in views from selected viewpoints where those viewpoints are considered to undergo a significant change in view.

6.2 Legislation and policy

6.2.1 National Planning Policy Framework

The LVIA has been considered in relation to the National Planning Policy Framework (NPPF) 2018. Chapter 12 of the NPPF - 'Achieving well-designed places' states that planning policies and decisions should ensure that developments:

- a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;
- b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;
- c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);

- d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;
- e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and
- f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience (paragraph 127).

Chapter 14 of the NPPF – ‘Meeting the challenge of climate change, flooding and coastal change’ states:

“Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that: a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change; b) the character of the coast including designations is not compromised; c) the development provides wider sustainability benefits; and d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.” (paragraph 168).

Chapter 15 of the NPPF – ‘Conserving and enhancing the natural environment’ states:

“Planning policies and decisions should contribute to and enhance the natural and local environment by: a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan); b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland; c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate; d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures; e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

... Take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries.” (paragraph 170).

Chapter 16 of the NPPF ‘Conserving and enhancing the historic environment’ states:

“Heritage assets range from sites and buildings of local historic value to those of the highest significance, such as World Heritage Sites which are internationally recognised to be of Outstanding Universal Value. These assets are an irreplaceable resource and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations.” (paragraph 184).

6.2.2 Local policy

The local planning framework comprises a number of key adopted documents which form the statutory development plan for each authority, against which proposals seeking planning permission are assessed. These policy documents comprise saved policies from extant Local Plans as well as new emerging policy documents.

The Scheme lies within the jurisdiction of North Lincolnshire Council. The North Lincolnshire Local Plan was adopted in May 2003 and is used to make planning decisions. This plan is gradually being replaced by the Local Development Framework. Some of its policies have been replaced following the adoption of the Core Strategy and the Housing and Employment Land Allocations DPD. Relevant policies are summarised in Table 6.1 below. Inset map 37 is included in Appendix 6.1 for further reference.

In terms of neighbourhood planning, whilst South Ferriby has been designated as its own neighbourhood area, a neighbourhood plan has not yet been submitted to the council.

Table 6.1: Summary of local policy on Landscape and Views

Policy No.	Title	Description
North Lincolnshire Council Core Strategy, adopted June 2011		
Spatial Objective 10	Creating a Quality Environment	“To transform North Lincolnshire’s image by ensuring that all new development exhibits a high standard of design and architectural quality that respects and enhances the distinctive landscapes and townscapes of North Lincolnshire’s towns and villages” (Page 25)
CS5	Delivering Quality Design in North Lincolnshire	<p>“Ensure it takes account of the existing built heritage from the earliest stages in the design process, in particular terms of scale, density, layout and access” (Page 56).</p> <p>“Incorporate the principles of sustainable development throughout the whole design process. This will include site layout, minimising energy consumption, maximising use of on-site renewable forms of energy whilst mitigating against the impacts of climate change; for instance, flood risk” (Page 56).</p> <p>“Provide flexibility in that new and existing buildings and spaces are able to respond to future social, technological, environmental and economic needs” (Page 56).</p> <p>“Incorporate appropriate landscaping and planting which enhances biodiversity or geological features whilst contributing to the creation of a network of linked greenspaces across the area. Tree planting and landscaping schemes can also assist in minimising the impacts of carbon emissions upon the environment” (Page 56).</p>
CS6	Historic Environment	<p>“Preserving and enhancing the rich archaeological heritage of North Lincolnshire” (Page 58).</p> <p>“...protect, conserve and enhance North Lincolnshire’s historic environment, as well as the character and setting of areas of acknowledged importance including historic buildings, conservation areas, listed buildings (both statutory and locally listed), registered parks and gardens, scheduled ancient monuments and archaeological remains. All new development must respect and enhance the local character and distinctiveness of the area in which it would be situated, particularly in areas with high heritage value.” (Page 58).</p>
CS16	North Lincolnshire’s Landscape, Greenspace and Waterscape	“The creation and maintenance of the network of landscape, green space and waterscapes will be secured by a range of measures, including protecting open space, creating new open spaces as part of new development, and by using developer contributions to create, improve and maintain green infrastructure assets where appropriate” (Page 110)

Policy No.	Title	Description
		<p>“improve the quality and quantity of accessible landscape, greenspace and waterscape, where appropriate” (Page 110)</p> <p>“Requiring development proposals to address local deficiencies in accessible landscape, waterscape and greenspace where appropriate” (Page 110)</p> <p>“Requiring the protection of trees, hedgerows and historic landscape to be specified where appropriate.” (Page 110)</p>
CS17	Biodiversity	<p>“Appropriate consideration being given to European and nationally important habitats and species.” (Page 111)</p> <p>“Maintaining and promoting a North Lincolnshire network of local wildlife sites and corridors, links and stepping stones between areas of natural green space.” (Page 111)</p> <p>“Ensuring development retains, protects and enhances features of biological and geological interest and provides for the appropriate management of these features.” (Page 111)</p> <p>“Ensuring development seeks to produce a net gain in biodiversity by designing in wildlife, and ensuring any unavoidable impacts are appropriately mitigated for.” (Page 111)</p> <p>“Supporting wildlife enhancements that contribute to the habitat restoration targets set out in the North Lincolnshire’s Nature Map and in national, regional and local biodiversity action plans.” (Page 111)</p> <p>“Improving access to and education/interpretation of biodiversity sites for tourism and the local population, providing their ecological integrity is not harmed.” (Page 111)</p>
CS18	Sustainable Resource Use and Climate Change	<p>“Supporting the necessary improvement of flood defences and surface water infrastructure required against the actions of climate change and preventing development in high flood risk areas wherever practicable and possible.” (Page 112)</p> <p>“Ensuring that development and land use in areas close to the Humber Estuary and rivers responds appropriately to the character of the area, in the interests of preserving and making best use of limited resources.” (Page 112)</p> <p>“Ensuring development and land use helps to protect people and the environment from unsafe, unhealthy and polluted environments, by protecting and improving the quality of the air, land and water.” (Page 112)</p> <p>“Promote the use of a greenspace strategy and a green infrastructure plan, where applicable, which could help reduce the effects of climate change.” (page 112)</p>
CS23	Sport Recreation and Open Space	<p>“Development proposals that will result in the loss of an existing leisure, recreation facility, natural green space, open space or playing pitches will not be supported unless: 1. There is currently an excess of provision; or 2. Satisfactory alternative provision equivalent or better quality and quantity in a suitable location is made; or 3. The facility is no longer needed.”(Page 138)</p>
LDF – Housing and employment land allocations (from inset 37 – South Ferriby within Appendix B)		
The remaining saved policies of North Lincolnshire Local Plan (NLLP) will continue to form part of the statutory development plan for North Lincolnshire until such time as they are		

Policy No.	Title	Description
replaced. These are listed below and shown on the Proposals Map accompanying the DPD to provide full and up to date policy mapping for development management purposes.		
LC12	Protection of Trees, Woodland and Hedgerows	<p>“...ensure the retention of trees, woodland and hedgerows. Particular regard will be given to the protection of these features within the setting of settlements, the protection of ancient woodlands and historic hedgerows and the amenity value of trees within built up areas. Tree preservation orders will be made where trees which contribute to local amenity or local landscape character are at risk. Landscaping and tree and hedgerow planting schemes will be required to accompany applications for new development where it is appropriate to the development and its setting.”</p> <p>“...Trees and woodland are relatively scarce in North Lincolnshire and are of particular importance in contributing to the character of the countryside. Similarly, hedgerows which are important to the character of the area particularly in relation to the scale and pattern of the landscape, and as a wildlife resource are markedly absent or in a state of decline through lack of proper management. There is a pressing need to protect and enhance these features not only through the control of development but also through encouraging farmers and landowners generally to increase tree and hedgerow planting and improve the management of such valuable features, including the retention of older trees where these are not prejudicial to public safety.” (Para 12.24)</p>
LC4	Development Affecting Sites of Local Nature Conservation Importance	“Any development or land use change which is likely to have an adverse impact on a Local Nature Reserve, a Site of Importance for Nature Conservation or a Regionally Important Geological Site will not be approved unless it can be clearly demonstrated that there are reasons for the proposal which outweigh the need to safeguard the intrinsic nature conservation value of the site or feature”.
LC1	Ramsar/SPA	“Proposals for development which may affect an SPA, a proposed SPA, a SAC or candidate SAC will be assessed according to their implications for the site’s conservation objectives. Proposals not directly connected with, or necessary for, the site, and which are likely to have a significant effect on the site (either individually or in combination with other proposals), will not be permitted unless it can be conclusively demonstrated that: i) there is no alternative solution; and ii) there are imperative reasons of overriding public interest for the development.”(Page 178)
HE8	Ancient Monuments	“Development proposals which would result in an adverse effect on Scheduled Ancient Monuments and other nationally important monuments, or their settings, will not be permitted.” (Page 206)
HE5	Listed Building	<p>“The Council will encourage the retention and restoration of the historic setting of listed buildings. Proposals which damage the setting of a listed building will be resisted.”(Page 204)</p> <p>“The setting of a building of special architectural or historic interest often contributes to its character. The setting could be its garden, grounds, open space or the general street scene. Developers are advised to contact the Council at an early stage to discuss the nature and extent of the setting. It is therefore important to consider the impacts of development</p>

Policy No.	Title	Description
		and other proposals within the vicinity of listed buildings. Control over the quality of design of new development in close proximity to a listed building will be necessary to protect its setting. Conditions may need to be imposed on such development to achieve the quality required.”(Page 205)
LC11	Area of Amenity Importance	“These areas should be protected from development which would adversely affect them. It is, therefore, essential that such areas are retained and enhanced wherever possible.” (Page 184)
RD2	Development in the Countryside	“Development in the open countryside will be strictly controlled. Planning permission will only be granted for development...provided that...the open countryside is the only appropriate location” (Page 93)
LC7	Landscape Protection	“Where development is permitted within rural settlements or within the open countryside, special attention will be given to the protection of the scenic quality and distinctive local character of the landscape. Development which does not respect the character of the local landscape will not be permitted.” (Page 182)

6.3 Methodology

6.3.1 Guidance and best practice

This LVIA has broadly followed the procedures set out in Guidelines for Landscape and Visual Impact Assessment (GLVIA) 3rd Edition (2013). GLVIA has been produced under the joint auspices of the Landscape Institute (LI) and the Institute of Environmental Management and Assessment (IEMA).

Construction and operational impacts have been assessed against both landscape character and visual receptors.

Landscape impacts were assessed through firstly establishing the existing landscape character through desk-based study and site survey, in order to determine the baseline conditions. The next step was to assess the impact (or change) of the Scheme on the landscape and determine to what extent it would affect the various elements and features which together make up the landscape character. The assessment of the effects sought to identify what changes are likely to occur as a result of the Scheme, and how they would 'fit', or otherwise, into the existing landscape character. The effect of the Scheme on landscape receptors was considered through determining the nature of the receptor likely to be affected and the nature of the effect likely to occur.

The visual impact assessment identified key receptors and views, through desk study and site survey. The change in view from particular viewpoints, known as visual receptors, was then considered. The assessment described the change in view between the existing view and the potential view with the Scheme in place. The sensitivity of the receptors was determined, in order to assess the magnitude and significance of visual effects, as well as whether the Scheme would be central or peripheral to the view, and the distance between the receptor and the site.

6.3.2 Study area

The study area for the landscape character assessment takes into account the landscape at a variety of scales. It considers the landscape character areas at a national scale as defined

within the National Character Areas (NCA) produced by Natural England. These, by their very nature, cover large areas whereas the Scheme covers only a small part of the landscape. The LVIA also considers those landscape character assessments produced by the Local Authority, and the smaller scale assessment undertaken as part of this LVIA.

The study area for the visual assessment was determined by establishing an approximate visual envelope. Considering the type and nature of the Scheme, an approximate visual envelope was considered appropriate. The visual envelope was relatively simple due to the generally flat landform which limits long distance views, large features, such as the cement factory, and the raised landform to the east which enclose views. Where the potential changes to landscape character and of views towards the Scheme are unlikely to be significant they have been excluded from this LVIA.

6.3.3 Receptors

Landscape receptors are the landscape character areas, landscape features, the setting of historical designated features and areas of local value which are likely to be impacted by the Scheme. Each receptor is considered in relation to their national, regional and local importance.

Visual receptors are locations from which people have views of the Scheme which are likely to experience a significant change in that view. These include private residential, commercial/industrial properties, publicly accessible areas such as parks and gardens and public rights of way, designated features and other features from where views of the Scheme are afforded, such as roads. Where appropriate, visual receptors that are physically close together with broadly similar views, and of the same sensitivity, have been grouped together in the assessment.

6.3.4 Defining the baseline

A desk-based study was undertaken to identify and review landscape character areas, local planning, heritage and ecological designations, and features of interest that make up the character of the landscape.

Baseline field surveys were undertaken involving site character analysis, through consideration of landform, vegetation, human influence (built form and culture) and the nature of views in general, and by identifying the visual receptors and their particular views.

6.3.5 Assessment of construction impacts

In order to assess the construction impacts for the Scheme, the following information was considered:

- Location of site compounds;
- Extent of the works required to facilitate construction, including working areas and haul routes;
- Vegetation clearance;
- Construction methods and likely plant and equipment, and
- Programme and phasing of works.

6.3.6 Assessment of operation impacts

In order to assess the operational impacts of the Scheme, the following information was considered:

- The location of the proposals in relation to other landscape elements; and

- The nature of the proposal and use of materials in relation to the existing landscape and visual amenity.

6.3.7 Nature of receptors

In order to determine the nature of the receptor likely to be affected, consideration is given to the susceptibility of the receptor to change and the value of the receptor. Typical descriptors of these judgements, for both landscape and visual receptors, are defined in Tables 6.2 and 6.3 below.

Table 6.2: Landscape Character Value (IAN 135/10, Highways England, 2010)

Value and Susceptibility to Change	Typical Descriptors
High	<p>Landscapes which by nature of their character would be unable to accommodate change of the type proposed. Typically, these would be:</p> <ul style="list-style-type: none"> ▪ Of high quality with distinctive elements and features making a positive contribution to character and sense of place ▪ Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale ▪ Areas of special recognised value through use, perception or historic and cultural associations ▪ Likely to contain features and elements that are rare and could not be replaced.
Medium	<p>Landscapes which by nature of their character would be able to partly accommodate change of the type proposed. Typically, these would be:</p> <ul style="list-style-type: none"> ▪ Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place ▪ Locally designated, or their value may be expressed through non-statutory local publications ▪ Containing some features of value through use, perception or historic and cultural associations ▪ Likely to contain some features and elements that could not be replaced
Low	<p>Landscapes which by nature of their character would be able to accommodate change of the type proposed. Typically, these would be:</p> <ul style="list-style-type: none"> ▪ Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place ▪ Not designated ▪ Containing few, if any, features of value through use, perception or historic and cultural associations ▪ Likely to contain few, if any, features and elements that could not be replaced

Table 6.3: Sensitivity of visual receptors and typical descriptors (IAN 135/10, Highways England, 2010)

Sensitivity	Typical Descriptors
High	<ul style="list-style-type: none"> ▪ Residential properties with views from ground and first floor windows and gardens towards the proposals. ▪ Important public sites used by many people. ▪ Public rights of way, public open spaces and other locations where the view is part of the reason for the visit.
Medium	<ul style="list-style-type: none"> ▪ Commercial and industrial premises ▪ Schools ▪ Playing fields ▪ Other areas where the view is not central to the use
Low	<ul style="list-style-type: none"> ▪ Roads and rail with views towards the development where the viewer passes at speed and the view is not central to the use.

6.3.8 Nature of effect (magnitude of impact)

In order to determine the nature of effect, consideration is given to the size and scale of the effect, the geographical extent of the area that will be affected, and the duration of the effect and its reversibility. Typical descriptors of these judgements, for both landscape and visual receptors, are defined in the Tables 6.4 and 6.5 below.

Table 6.4: Magnitude of impact for landscape character effects (IAN 135/10, Highways England, 2010)

Significance	Typical Descriptors
Major adverse	Total loss or large-scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements.
Moderate adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements.
Minor adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
Negligible adverse	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
No change	No noticeable loss, damage or alteration to character or features or elements.
Negligible beneficial	Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic features.
Minor beneficial	Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic

Significance	Typical Descriptors
	features and elements, or by the addition of new characteristic elements.
Moderate beneficial	Partial or noticeable improvement of character by the restoration of existing features and element, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Major beneficial	Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.

Typical descriptors or criteria for the magnitude of visual impact are listed in Table 6.5, following the logic that the greater the change, the more major the impact.

Table 6.5: Magnitude of visual impact and typical descriptors (IAN 135/10, Highways England, 2010)

Magnitude of Impact	Typical Criteria Descriptors
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature of element of the view.
No Change	No part of the project, or work or activity associated with it, is discernible.

6.3.9 Significance of effect

Significance of effect of the Scheme on each landscape and visual receptor has been determined through combining the judgements made for the nature of the receptor and the nature of the effect and summarised through categories of significance, as indicated in the tables below. Table 6.6 provides typical descriptions for the level of significance of impact for changes to the landscape character for both adverse and beneficial effects while Table 6.7 provides typical descriptions for the level of significance of impact for changes to the view for both adverse and beneficial effects.

Table 6.6: Significance of landscape effects (IAN 135/10, Highways England, 2010)

Value and susceptibility to change	Magnitude of Impact (Degree of Change)				
	No Change	Negligible	Minor	Moderate	Major
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large

Value and susceptibility to change	Magnitude of Impact (Degree of Change)				
	No Change	Negligible	Minor	Moderate	Major
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate

Table 6.7: Significance of visual effects (IAN 135/10, Highways England, 2010)

Sensitivity of visual receptor	Magnitude of Impact (Degree of Change)				
	No Change	Negligible	Minor	Moderate	Major
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate

6.4 Existing environment

6.4.1 Baseline and value of resource

Landscape designations

Whilst there are no landscape designations within the site and in its local context there are several internationally important ecological designations (Ramsar, SAC, SPA and SSSI) and several historic designations (including Scheduled Monument and Listed Buildings). These are defined on Figure 5.1 and Figures 7.1 – 7.3 in Appendix 1.1 and considered in more detail in chapters 5 (Biodiversity) and 7 (Cultural Heritage).

Conservation Areas

Conservation Areas are designated under the Planning (Listed Buildings and Conservation Areas) Act 1990 due to their special character and quality.

Whilst the site does not lie in a conservation area there are several in the local area. The nearest Conservation Areas to the site are listed below:

- Winterringham Conservation Area – Approximately 4.8km west of the site;
- Barton-upon-Humber Conservation Area – Just over 4.8km east of the site; and
- Winterton Conservation Area - Approximately 6.4km south west of the site.

Potential effects on these conservation areas are not considered to be significant due to the distance and are therefore not considered in any further assessment.

Heritage assets

The Scheme may impact the setting of Listed Buildings and other heritage assets. The location of the Listed Buildings and local Scheduled Monuments is shown on Figure 6.3.

Heritage assets such as Listed Buildings and Scheduled Monuments by their very nature and designation are valued as high value / susceptibility to change.

Table 6.8: Heritage assets

Listed Buildings	Description
South Ferriby Hall (Grade II)	South Ferriby Hall lies approximately 215 m east of the site
Woodside Farmhouse (Grade II)	Lies approximately 170 m east of the site
Glentworth House (Grade II)	Lies approximately 280 m east of the site
Church of Saint Nicholas (Grade II*)	Lies on elevated ground approximately 365 m south east of the site.
Ferriby Sluice (Scheduled Monument)	Lies over the River Ancholme, within the site

Landscape character regional overview

This section considers the wider landscape character and context through consideration of the NCAs within which the Scheme sits. The Scheme sits within the Humber Estuary National Character Area (NCA 44) the text below is a summary developed from the area profile.

The Humber Estuary NCA 44 covers the open expansive waters of the Humber and low-lying estuarine landscape, characterised by extensive stretches of intertidal habitats including mudflats, salt marsh and reedbeds, coastal dunes and wetlands along the side of the estuary.

The distinctive landscape character is a product of dynamic geomorphological estuarine processes. As the tides go in and out, high suspended sediment loads feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sand flats, salt marsh, saline lagoons and reedbeds.

The importance of the coast for biodiversity is recognised by its international significance as a Ramsar site and Special Protection Area for the large flocks of overwintering, migratory and breeding birds. Its geomorphology and range of intertidal habitats (and associated lampreys and breeding colonies of grey seals) have resulted in its designation as a Special Area of Conservation.

The NCA's rich archaeology provides evidence of a long history of settlement. Archaeological evidence shows that the estuary has been a key trade and communication route since prehistoric times. Significant palaeoenvironmental 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.

The NCA features large conurbations (Kingston upon Hull, Immingham and Immingham Docks) which contrast with the sparsely populated rural areas, scattered hamlets and small towns.

Key characteristics of the NCA which are present within the Scheme area and its context include:

- Habitats present (international importance) - Extensive stretches of intertidal habitats including mudflats, salt marsh and reedbeds, and wetlands along the side of the estuary. There is very little woodland in the rural areas;

- Land use - Land has largely been reclaimed, resulting in large fields, bounded by ditches, which form high-quality arable cropping land. The estuary is a very busy waterway, with both passenger and commercial traffic accessing the many ports both within the estuary and upstream;
- Settlement patterns - large, dispersed farmsteads and small villages on higher ground are set within a quiet rural landscape;
- Green Infrastructure - Many ditches form important networks linking the few other semi-natural habitats;
- Big skies and open views over the estuary, mudflats and salt marshes, where flood embankments allow, with views of extensive and large scale industrial installations especially on the south bank.
- Key risks threatening the NCA include rising sea levels leading to major flood events and coastal squeeze. There is increased pressure for development and a need to ensure developments are well assimilated and sustainably sited.
- Key opportunities set out in the NCA for enhancement are included below:
 - 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;
 - Work with landowners and managers to incorporate more habitats and features into the farmed landscapes. Encouraging the creation and management of fresh water habitats, wet grasslands and brackish water habitats;
 - Conserving the network of drains, ditches and dykes and managing them so that they form effective habitats (avoid drawing in saline waters);
 - Improve green infrastructure links between urban and rural areas;
 - Seek opportunities for public enjoyment of the open, expansive landscape and its dynamic coastal features and wildlife; and
 - Raising awareness of the importance of the roosting and feeding areas for birds around the estuary, ensuring that they are adequately protected and managed.

The landscape associated with the Scheme displays many of the characteristics associated with this NCA. Whilst the character area is considered important due to its distinctive landscape and international ecological designations, it is considered that the nature of the works proposed i.e. the relocated flood banks, are already features of the existing landscape and could be accommodated and assimilated into its setting with only a localised impact. For these reasons the character area has been given a medium value and susceptibility to change.

Local authority character areas

North Lincolnshire Landscape Character Assessment (Estell Warren LA, 1999) identifies that the site falls within the Flat Drained Farmland Landscape Character Type (LCT)– The Flats, North Lincolnshire Edge, Read’s Island, Winteringham Ings.

This character area starts on the western boarder of North Lincolnshire and runs along the ‘inner estuary’ to Winteringham Ings in the east, encompassing Read’s Island. To the south and east the boundary of the character area is defined by the scarp slope of ‘The Cliff’.

The distinctively flat, predominantly agricultural, landscape is the product of poorly drained alluvial heavily gleyed soils around the estuary and extensive drainage modifications. Settlement patterns are limited to linear settlements along main road networks and clusters of housing on higher ground.

Characteristics of the Flat Drained Farmland character area that are also present within the study area of the site include:

- Intensive farming has degraded the rural appearance which consists of open, flat, low-lying arable landscape comprising a broad expanse of large rectilinear drained fields bordered by well-kept ditches, hedges and a few associated hedgerow trees. Hedgerow remnants are well clipped and with gaps;
- Settlements, farmsteads and roads are scarce with some development near to South Ferriby. Housing is of different periods and lacks unity, often sitting awkwardly in the landscape;
- Farms have large modern sheds that are often imposing;
- Large scale industry around South Ferriby interrupts the expansive skyline;
- Woodland blocks within this local landscape type are scarce, although elevated slopes of adjacent landscape character types lend their influence over the area; and
- Views of the Humber Bridge and coastal activity.

The landscape associated with the Scheme displays many of the characteristics of this character area. Whilst there are several strands of human influence that have degraded the visual amenity of the character area, such as the presence of industry, intensive farming, flood defences, eclectic mix of houses along Sluice Road and visual detractors associated with the bridge, there remains an unyielding presence of the dynamic estuarine landscape. Given the many designations that the character area affords and the international status of these designations the Character area is considered to have a medium value.

Character of the site

This section of the report describes the landscape character of the site. It is broadly divided into five areas, listed below and defined in Figure 6.4:

1. Settled Wooded Slopes;
2. Ribbon settlement along Sluice Road (A1077);
3. Estuarine Flats and Farmland;
4. Marina Area; and
5. CEMEX industrial works.

The landform of the site is generally flat, rising up to the east where residential receptors and motorists are afforded glimpsed and elevated views towards the Humber.

Vegetation in general is limited to woodland blocks along the eastern escarpment, tree planting amongst the cluster of housing on its elevated slopes, smaller clusters of woodland blocks amongst the field network in the south, trees along the River Ancholme, and intermittent tree planting along Sluice Road.

There is a wide range of building form, primarily relating to land uses. These range from distinct individual buildings such as South Ferriby Hall (Grade II), or Woodside Farmhouse (Grade II) to the CEMEX factory which pierces the skyline. In between these contrasting styles is an eclectic mix of housing styles, types and eras, especially along Sluice Road where 1960-1980s red brick terraced houses and bungalows are common, broken up by older detached housing of varying styles and ages.

The settled wooded slopes area is defined by rising topography and an elevated, treed backdrop. Elevated glimpsed views are afforded towards the Humber Estuary from

residential receptors and main roads that dissect the landscape. The settlement boasts five listed buildings and has a more cohesive character in places, such as along North End and Farrisches Lane where no formal footpaths exist along the narrow rural lanes, which instead are either fronted immediately by terraced houses of mixed styles or grass verges. The Church of Saint Nicolas sits on the eastern edge of the settlement looking down over the rest of the settlement towards the Humber. Intervening housing along Sluice Road limits views towards the old flood defences. Due to the heritage assets it contains and the rural nature of the settlement, not to mention the extensive elevated views that are afforded to this settlement, this character area is considered to have a medium value.

The ribbon settlement between the harbour and wooded slopes along Sluice Road does not contain any designated assets and is not considered cohesive in character, it therefore is considered medium in value and susceptibility to change. Estuarine Flats and Farmland are defined by both the inter-tidal habitats that are present along the shore and the intensively farmed fields immediately south of them. Separating them is the existing flood defence in the form of a raised bund, upon which a long-distance footpath runs. Due to the designated habitats it supports, and the contribution this designation makes to the value of its character, this character area is considered to have a medium value.

The marina contains the bridge, Hope and Anchor Pub, The Square and The Lock house. It also contains a Scheduled Monument (Ferriby Sluice), flood walls, flood gates, differing styles of fencing, traffic signals, fencing, signage and artefacts associated with the marina such as anchors, add a level of visual clutter. Given the number of visual detractors the marina is considered to be medium in value.

The CEMEX industrial works built form dominates South Ferriby's skyline. Whilst some measures have been taken to soften its visual impact (such as formal tree planting along Sluice Road), its use as a place of work results in a lower sensitivity to change and a higher capacity to accommodate a flood alleviation scheme. For these reasons the industrial site is considered to be medium in value.

Visual amenity

There are a number of visual receptors that would experience a change in view as a result of the Scheme and during its construction. To avoid repetition, the description of the existing view is given, along with the description of the potential changes, below in the visual assessment section. General views are provided in Figure 6.1.

6.4.2 Evolution of the baseline without the Scheme

The landscape of the area is likely to become more estuarine in nature if a breach occurs, with the development of inter-tidal type habitats (mud flats and salt marsh). Section 9.4.7 provides further detail on the likely geomorphological changes associated with a breach.

6.5 Mitigation and enhancements

In assessing the potential landscape and visual impacts a number of measures have been included with the Scheme proposals to design out negative effects. In addition, where the opportunity has arisen enhancement measures have also been included. The scheme provides opportunities for additional habitat creation such as the proposed areas of woodland, gapping up of existing hedges, ditch profiling for water vole habitat creation and NVC MG5 grassland. This will result in a network of habitats across the Scheme and enhance the existing networks that exist. These enhancement measures which are detailed in Figure 6.3 are in line with the objectives described above in the NCA profiles

Table 6.9: Measures adopted as part of the Scheme

Measure	Effect
Proposed NVC MG5 grassland mix and Wildflower seeding on landward side of proposed flood bank (15m wide x 2787m long)	Ecological enhancement measure that will also soften the impact of the proposed floodbank within views through the use of an informal / native seed mix.
Proposed Woodland (mitigation of loss of trees plus enhancement) and scrub planting	Proposed woodland edge planting serves to mitigate the loss of hedgerow trees. A ratio of 1:3 tree loss to tree gain has been used. Species mixes to be agreed with Local Authority.
Proposed replacement hedgerow Gapping up of existing hedgerow	Mitigate the loss of existing hedgerow and enhancement of retained hedgerows for visual consistency and higher value features.
Drain enhancement / water vole habitat	Soften the impact of the proposal in views
Brick facing	The defence walls would be primarily brick clad in places on both sides rather than a concrete finish. Brick type and bond to match adjacent buildings so that there is continuity of material. More detail regarding cladding can be found in the summary.
Information boards to be installed to provide visitor information about the heritage and biology of the area.	Provide a greater awareness and understanding of the area and what people can do to support it.

6.6 Likely significant effects

6.6.1 Assessment of landscape effects

During construction

This section outlines the potential effects during the construction phase (Table 6.10). Typical construction phase features are likely to include large scale machinery and plant such as piling rigs, excavators and lorries, safety fencing and barriers, the construction compounds and the movement of vehicles to and from the compounds.

Table 6.10: Potential effects of the Scheme on Listed Buildings/Scheduled Monuments during construction

Listed Building	Description	Effect
South Ferriby Hall (Grade II)	Given the orientation of the hall, presence of intervening vegetation and distance to the area where works would take place there would be limited impact on the immediate setting of the hall, but with some adverse impact within the wider context and in terms of tranquillity (large machinery, noise, dust and vibrations).	Value: high Magnitude: negligible / minor adverse Significance: slight adverse

Listed Building	Description	Effect
Woodside Farmhouse (Grade II)	Whilst the immediate setting would not be adversely affected (due to distance to the site and the presence of intervening built form and housing), the wider setting would be adversely affected by construction of the flood defence, with filtered views towards construction activity (21-25 t excavators, dozers and rollers and being serviced by either tracked dumpers or 25 t articulated dumpers). There would be adverse effects on tranquillity (large machinery, noise, dust and vibrations).	Value: high Magnitude: negligible / minor adverse Significance: slight adverse
Glentworth House (Grade II)	Whilst the immediate setting would not be affected, there would be elevated views towards construction activity along the Humber. Lighting at compounds would be visible in the distance as a detracting feature in views.	Value: high Magnitude: minor adverse Significance: slight adverse
Church of Saint Nicholas (Grade II*)	Whilst the immediate setting would not be affected, the wider setting of this chapel (including the flat estuarine landscape with regular field patterns) would be temporarily affected by the works (21-25 t excavators, dozers and rollers and being serviced by either tracked dumpers or 25 t articulated dumpers). Lighting at compounds would be visible in the distance as a detracting feature in views.	Value: high Magnitude: minor adverse Significance: slight adverse

Regional Landscape character – Humber Estuary NCA 44

Whilst construction activity within the site would be seen from the Humber and within South Ferriby, the percentage of the character area that would be temporarily affected is small in comparison to the wider area.

The character area is valued as medium, the magnitude of impacts is minor adverse, and significance of effect is slight adverse.

Local Authority Character Areas - Flat Drained Farmland

Construction activity, including heavy machinery and construction traffic, (21-25 t excavators, dozers and rollers and being serviced by either tracked dumpers or 25 t articulated dumpers as well as the temporary use of a Movax piling rig), new compounds and associated storage units and lighting, as well as the new defences and walls would adversely affect a small section of the character area temporarily.

Most sites will require topsoil stripping down to approximately 200mm. Top soil will be stored locally within the working areas and used to reinstate the banks once constructed. Material for the embankments to be raised or constructed would initially be stockpiled at the western end of the Scheme. Material would then be moved to the site where it is required and stored more locally.

The level of tranquillity would be reduced both in the immediate area and in views from higher ground and the Humber. The impact of construction works in combination with other

existing detracting features within the landscape would have a disruptive effect on the character of the area.

The character area is valued as medium, the magnitude of impacts is moderate adverse, and significance of effect is moderate adverse.

Site-specific Character Areas

Individual impacts on the local character have been summarised in the following table below:

Table 6.11: Potential effects of the Scheme on local character during construction

Character Area	Description of effect	Summary
Settled Wooded Slopes	Some adverse impact within the wider context and in terms of tranquillity (large machinery, noise, dust and vibrations). The setting of this character area (looking over a flat estuarine landscape with some housing in the foreground of the view) would be adversely affected by the disruptive nature of uncharacteristic noticeable features and elements.	Value: medium Magnitude: minor adverse Significance: slight adverse
Ribbon settlement along Sluice Road (A1077);	Temporary large-scale construction activity to the north will have temporarily disruptive impact on the setting and tranquillity of this character area which looks out towards the Humber.	Value: medium Magnitude: major / moderate adverse Significance: moderate / large adverse
Estuarine Flats and Farmland	Temporary large-scale construction activity throughout most of the character area will have a considerably urbanising impact on the character and the quality of the landscape. The introduction of additional flood embankments would divide the estuarine landscape and alter the pattern of fields bordering the estuary.	Value: high value Magnitude: major / moderate adverse Significance: Large adverse
Marina	Construction work around the marina would have an urbanising effect on the character of the area. Whilst there are many visual detractors associated with the marina, the tranquillity of the area would be adversely affected (if only temporarily) by the noise, dust, visual impact of associated construction activity.	Value: medium Magnitude: moderate adverse Significance: moderate adverse
CEMEX industrial Works	Whilst this character area would experience changes in views and the urbanising impact of construction activity, it is a place of work and is considered to be able to accommodate most types of change due to the nature of the receptor.	Value: medium Magnitude: minor / moderate adverse

Character Area	Description of effect	Summary
		Significance: slight adverse

During operation

This section outlines the potential changes in the landscape as a result of the Scheme on its completion.

Table 6.12: Potential effects of the Scheme on Listed Buildings / Scheduled Monuments during operation

Listed Building	Description	Effect
South Ferriby Hall (Grade II)	Given the orientation of the hall, presence of intervening vegetation and distance to the area where works would take place there would be limited impact on the immediate setting of the hall, but with some adverse impact within the wider setting due to the introduction of additional flood banks that dissect the rural wider setting of this heritage asset.	Value: high Magnitude: negligible / minor adverse Significance: slight adverse
Woodside Farmhouse (Grade II)	Whilst the immediate setting would not be adversely affected (due to distance to the site and the presence of intervening built form and vegetation), the wider setting would be adversely affected by construction of the flood defence, some adverse impact within the wider setting due to the introduction of additional urbanising elements (the flood bank)	Value: high Magnitude: negligible / minor adverse Significance: slight adverse/neutral
Glentworth House (Grade II)	The receptor is at such a distance that the presence of the Scheme would not impact on its setting.	Value: high Magnitude: negligible adverse Significance: neutral
Church of Saint Nicholas (grade II*)	The receptor is at such a distance that the presence of the Scheme would not impact on its setting.	Value: high Magnitude: negligible adverse

Listed Building	Description	Effect
		Significance: neutral

Regional Landscape character – Humber Estuary NCA 44

The proposals are for the repositioning and raising of the existing flood defence banks, it introduces features which are already present in the site. Given the nature of the proposal and the percentage of the character area that would be affected by the Scheme, the magnitude of impact is considered to be minor.

The character area is valued as medium, the magnitude of impacts is negligible adverse, and significant of effect is neutral.

Local Authority Character Areas - Flat Drained Farmland

The proposals are for the repositioning and raising of the existing flood defence banks, it introduces features which are already present in the site. Given the nature of the proposal and the percentage of the character area that would be affected by the Scheme, the magnitude of impact is considered to be moderate / minor.

The character area is valued as medium, the magnitude of impacts is moderate / minor adverse, and significant of effect is slight / moderate adverse.

Site-specific Character Areas

Individual impacts on the local character have been summarised in the following table below:

Table 6.13: Potential effects of the Scheme on local character during operation

Character Area	Description of effect	Summary
Settled Wooded Slopes	The nature of change (soft flood defence features are not uncharacteristic of the baseline landscape) means it will be easily assimilated into the landscape, reducing the magnitude of change.	Value: medium Magnitude: negligible / minor adverse Significance: slight adverse
Ribbon settlement along Sluice Road (A1077);	The works are unlikely to affect the character of the ribbon settlement apart from in associated views across the Humber which would have additional urbanising features in the middle distance of this occasional view.	Value: medium Magnitude: moderate adverse Significance: moderate adverse
Estuarine Flats and Farmland	The introduction of additional flood embankments would divide the estuarine landscape and result in a patchwork of varying parcels of land and an adverse impact on the existing baseline character.	Value: high value Magnitude: moderate adverse

Character Area	Description of effect	Summary
		Significance: moderate adverse
Marina	Features proposed are already present within the site and its immediate setting. The presence of visual detractors around the marina and careful material selection (such as the use of brick cladding to match existing) will help to assimilate the Scheme into its setting.	Value: medium Magnitude: minor adverse Significance: slight adverse
CEMEX cement factory	Whilst this character area would experience some changes in views, it is a place of work and is considered to be able to accommodate most types of change due to the nature of the receptor.	Value: low Magnitude: minor Significance: neutral

6.6.2 Assessment of visual effects

This section outlines the potential changes in view at a range of visual receptors and covers both during construction and during operation effects. General views have been included in Figure 6.1 and Appendix 6.1.

Table 6.14: Potential effects of the Scheme on views during construction and operation as indicated on Figure 6.1.

Visual receptor	Existing view	Effects during construction	Effects during operation
High Value Receptors – Listed Buildings			
A: South Ferriby Hall (Grade II)	Filtered views from the grounds of the hall north west towards the site	Filtered winter views of large machinery from upper storeys of South Ferriby Hall	Views to the Scheme are limited by intervening vegetation. Elements introduced are not uncharacteristic within available views. Value: high Magnitude: minor / negligible Significance: slight
B: Woodside Farmhouse (Grade II)	Filtered and glimpsed upper storey views towards the Humber	Filtered upper storey glimpsed views of large machinery from upper storeys of listed building	Views to the works are limited by intervening vegetation. Elements introduced are not uncharacteristic within available views. Value: high Magnitude: minor / negligible Significance: slight
C: Glentworth House (Grade II)	Potential upper storey glimpsed and filtered elevated views towards the Humber	Lighting associated with the construction compounds around the site could be visible at night and have an urbanising impact in views. Within available elevated views construction machinery and storage compounds will be visible in the middle distance and result in the temporary partial loss of existing character / the distinctive estuarine banks.	During operation the Scheme is considered to be at such a distance that they are not discernible in views. Value: high Magnitude: negligible Significance: slight

Visual receptor	Existing view	Effects during construction	Effects during operation
D: Church of Saint Nicholas (Grade II*)	Framed elevated views are afforded from the cemetery / grounds of the church north west across to the Humber with the settlement of South Ferriby in the middle distance	Construction activity would have an urbanising impact on the middle distance of the view. Whilst intervening housing screens the majority of the flood wall installation, the works associated with the new foodbanks would be visible amongst the flat rural fields. At night additional security lighting associated with compounds would provide additional temporary light pollution within the big skies associated with the Humber	Given the nature of the Scheme it is considered that there will be little change within views from this receptor. Value: high Magnitude: negligible Significance: slight
High Value Receptors – Long distance PRow			
E: Long Distance trail SFER 32	Elevated views are afforded along a small stretch of Middlegate Lane to the south of the church where a gap in vegetation allows for views over this Listed Building towards the Humber	Construction activity would have an urbanising impact on the middle distance of the view. Whilst intervening housing screens the majority of the flood wall installation, the works associated with the new foodbanks would be visible amongst the flat rural fields. At night additional security lighting associated with compounds would provide additional temporary light pollution within the big skies associated with the Humber.	Given the nature of the Scheme it is considered that there will be little change within views from this receptor. Value: high Magnitude: negligible Significance: slight
F: Nev Cole Way Long Distance Route	This route, which runs along the existing flood embankment to the east of The Sluice and along Sluice Road to the west of the Sluice, affords views north across the Humber estuary and south towards housing bordering Sluice Road	During construction views out towards the Humber will be retained along the existing embankment to the east of the Sluice. Views south from the existing embankment will be disrupted by construction activity. To the west of the sluice existing vegetation will screen some construction activity, however the construction of the new flood embankment to the south of Sluice Road will be visible and readily apparent, if temporary in nature. It is anticipated that there will be a natural breach of the existing flood embankment that Nev Cole Way runs along. Any	The Scheme, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view. Value: high Magnitude: minor Significance: moderate temporary

Visual receptor	Existing view	Effects during construction	Effects during operation
		changes to views during operation are therefore considered temporary in nature.	
G: PRoW FP/SFER/30	Views along the River Ancholme north towards the scheduled Ferriby Sluice and south towards Bridge Lane	During construction there would be views of works on the drawbridge and views to the ground regrading works and compound on the eastern bank.	The works would be perceptible but not alter the overall balance of features and elements that comprise the existing view. Value: high Magnitude: minor Significance: slight
H: PRoW FP/SFER/24	Views along the River Ancholme north towards the scheduled Ferriby Sluice and south towards Bridge Lane	During construction there would be views of works on the drawbridge and views to the ground regrading works and compound on the eastern bank.	The works would be perceptible but not alter the overall balance of features and elements that comprise the existing view. Value: high Magnitude: minor Significance: slight
High Value Receptors – Residential Receptors			
I: Residential Receptors on the Settled Wooded Slopes Character Area	Upper storey, elevated glimpsed and filtered views towards the Humber are afforded from residential properties on the western slopes of the escarpment. Residential properties along Sluice Road are visible in the middle distance and break up the rural landscape character	Construction activity would have an urbanising impact on the middle distance of the view. Whilst intervening housing screens the majority of the flood wall installation, the works associated with the new foodbanks would be visible amongst the flat rural fields. At night additional security lighting associated with compounds would provide additional temporary light pollution within the big skies associated with the Humber	Given the nature of the Scheme it is considered that there will be little change within views from these receptors. Value: high Magnitude: negligible Significance: slight

Visual receptor	Existing view	Effects during construction	Effects during operation
J: Ribbon settlement along Sluice Road (A1077)	Upper storey open views are afforded from houses orientated north towards the Humber from Sluice Road. Local topography and intervening vegetation screens the majority of lower storey views. Exceptions occur where occasional gaps in the hedgerow afford glimpsed views or in views from the curtilage of houses north of Sluice Road.	Construction activity would have a temporarily urbanising impact within the foreground to middle distance of upper storey views through the introduction of uncharacteristic elements such as hoarding, construction machinery, traffic control measures, construction traffic, compounds and associated lighting.	<p>The new flood embankment, flood walls, demountable defences and stop logs would result in a partial rationalisation of boundary treatment in views in close proximity to the sluice, through the use of brick render on all proposed and retained walls.</p> <p>In the immediate to middle distance the presence of a new flood embankment in the landscape would, further divide the landscape in views, which would adversely impact the quality of views and perception of the estuarine landscape at a local scale.</p> <p>Conversely features introduced are characteristic of the current baseline situation.</p> <p>Value: high Magnitude: negligible / minor Significance: slight / moderate</p>
K: The Hope and Anchor Public House	Views are afforded across the Humber, the Landing Stages to the east of the Hope and Anchor Pub, the Sluice and the estuarine flats.	Construction activity would have a temporarily urbanising impact within the foreground to middle distance of available views through the introduction of uncharacteristic elements such as hoarding, construction machinery, traffic control measures, construction traffic, compounds and associated lighting.	<p>With the new demountable defences, flood walls, embankments and other associated features of the Scheme, there would be limited change in views due to the nature of the Scheme which would be introducing characteristic features.</p> <p>The magnitude of change (walls are 1.2 m high in the immediate vicinity) would also be low in available views.</p>

Visual receptor	Existing view	Effects during construction	Effects during operation
			Value: high Magnitude: negligible / minor Significance: slight
L: The Square and The House	Existing vegetation within the curtilage of the properties, as well as tall boundary treatments and intervening built form, restrict views to upper-storey filtered views north to the Humber, south on Sluice Road, east across the rural fields bordering the Humber and west towards the sluice and drawbridge.	Construction activity would have a temporarily urbanising impact within the foreground to middle distance of available views through the introduction of uncharacteristic elements such as hoarding, construction machinery, traffic control measures, construction traffic, compounds and associated lighting.	New elements will be introduced, in the form of brick-clad flood walls, demountable defences, stoplogs and flood embankments. These features will be noticeable and readily apparent to the receptor but are not uncharacteristic within existing views. Value: high Magnitude: negligible / minor Significance: slight
Medium Value Receptors – Commercial and Industrial Premises			
M: CEMEX	Existing vegetation along Sluice Road and on the boundaries of the receptor limit views. Occasional filtered views from the grounds of the premises north and west.	Construction activity would have a temporarily urbanising impact within the foreground to middle distance of available views through the introduction of uncharacteristic elements such as hoarding, construction machinery, traffic control measures, construction traffic, compounds and associated lighting to the north and west of the receptor.	The new / raised embankments would be visible but would not alter the balance of features within existing views. Proposed woodland planting would not be visible amongst existing vegetation and built form. Value: medium Magnitude: minor Significance: slight
N: The Marina	Existing views available include the Humber to the north and the Landings to the east with glimpsed views to rural fields beyond and the escarpment on the horizon. To the south views are afforded down the River Ancholme, and to the west there are limited views towards the	Construction activity would have a temporarily urbanising impact within the foreground to middle distance of available views through the introduction of uncharacteristic elements as described above. Specific change would occur around the new flood wall that will divide the	The new / raised embankments would be visible but would not alter the balance of features within existing views.

Visual receptor	Existing view	Effects during construction	Effects during operation
	rural fields bordering the Humber with intervening vegetation screening views beyond.	properties on the Landings, along the slipway and across Sluice Road.	Value: medium Magnitude: minor Significance: slight
Low Value Receptors - Roads			
O: Sluice Road (A1077)	Where Sluice Road enters the Scheme views north are glimpsed and predominantly screened by housing and vegetation. Views south are limited by existing housing and vegetation to transitional glimpsed views down the River Ancholme.	Construction activity would have a temporarily urbanising impact within the foreground to middle distance of available views through the introduction of uncharacteristic elements as described above. Specific change would occur around the marina and within fields to the north where the new flood embankment's construction would have an urbanising impact in views.	The overall change to the balance of features within available glimpsed views will be perceptible (especially where hedgerows are removed, and replacement planting is still developing). Conversely the features introduced are considered to be characteristic of the baseline. Value: low Magnitude: negligible Significance: neutral / slight
P: Middlegate Lane / High Street	Elevated views are afforded along a small stretch of Middlegate Lane to the south of the church where a gap in vegetation allows for views over this Listed Building towards the Humber. Some elevated framed / glimpsed views along the High Street where gaps in housing and vegetation allow.	Construction activity would have an urbanising impact on the middle distance of the view. Whilst intervening housing screens the majority of the flood wall installation, the works associated with the new foodbanks would be visible amongst the flat rural fields. At night additional security lighting associated with compounds would provide additional temporary light pollution within the big skies associated with the Humber.	Given the nature of the proposal it is considered that there will be little change within views from this receptor. Value: low Magnitude: negligible Significance: slight

6.7 Residual effects

Residual effects are those that remain once vegetation has matured and established sufficiently to mitigate the landscape and visual impact of the proposal. The table below lists receptors that remain adversely impacted post mitigation.

Table 6.15: Summary of residual effects of the Scheme post establishment of mitigation

Receptor	Description / scenario	Residual effect
Listed Buildings (including South Ferriby Hall, Woodside Farmhouse, Glentworth House, Church of Saint Nicholas).	The wider setting will be adversely affected by the further subdivision of the landscape. This will become less apparent as existing vegetation matures, however the setting will experience permanent change in the form of segregated fields.	Value: high Magnitude: minor / negligible Significance: slight
Long distance PRow (including Long Distance trail SFER 32 and Nev Cole Way Long Distance Route)	It is anticipated that there will be a natural breach of the existing flood embankment that Nev Cole Way runs along. Any changes to views during operation are therefore considered temporary in nature. The proposal may be discernible in views from SFER 32, but only in glimpsed distant views towards the Humber.	Value: high Magnitude: minor Significance: moderate temporary / slight
PRow (FP/SFER/30, FP/SFER/24)	That which is proposed would not alter the balance of features / elements in views from these receptors.	Value: high Magnitude: minor Significance: slight
Residential Receptors (see Table 6.14)	The majority of views from residential receptors are upper story views north towards the Humber. Whilst the proposed floodbank is characteristic of the existing landscape the balance of features within the view will be altered by the segregation of rural fields.	Value: high Magnitude: negligible Significance: slight impact significance for the majority of residential receptors. Moderate impact significance for residents where the floodbank comes in close proximity to Sluice road.
Commercial and industrial premises (CEMEX, The Marina)	The new / raised embankments would be visible but would not alter the balance of features within existing views.	Value: medium Magnitude: minor Significance: slight
Roads (Middlegate Lane, Sluice Road)	The new / raised embankments would be visible but would not alter the balance of features within existing views.	Value: low Magnitude: negligible

Receptor	Description / scenario	Residual effect
		Significance: neutral / slight
Local Character areas of high / medium value (Settled Wooded Slopes, Ribbon settlement along Sluice Road (A1077), Estuarine Flats and Farmland, Marina)	These character areas are either of high value or the magnitude of change is such that the impact significance is considered to remain adverse even following the establishment of replacement planting.	Value: high / medium Magnitude: moderate / minor adverse Significance: moderate / slight
Local Authority Character Areas - Flat Drained Farmland	The proposal will result in the segregation of land uses into smaller pockets of land. Whilst this will only affect a small percentage of the character area, the changes will be easily identifiable within the local context of the proposal.	Value: medium Magnitude: moderate / minor adverse Significance: moderate / slight adverse

6.7.1 Summary

The proposed Scheme is associated with several landscape characters at different scales, central to which is the South Ferriby docklands landscape with its galvanised boundary fences, concrete walls and paved areas, industrial and commercial buildings and the visual clutter associated with dock activities and storage. The built form of CEMEX dwarfs the adjacent landscape and urbanises its character.

The existing flood defence bank is being left to breach naturally and this is considered to be a natural process that will occur as part of the baseline situation, it is therefore not considered as part of the effects of the proposed scheme.

The introduction of a new flood defence is proposed inland, to the south of the existing flood bank. Whilst the Scheme is not introducing features into the landscape which are uncommon, the resulting landscape would be further dissected by the flood bank resulting in a patchwork of small scale fields intersected by tall mounded earth forms and walls. The effect of this change is limited to the local context of the site and available views north towards the Humber.

Most receptors are residential and inter-visibility is limited to upper storey views over intervening vegetation. Whilst the resulting landscape would be considered more complex it would not be overly uncharacteristic within available local views. It would result in a localised adverse impact on the local character of the area.

The proposed defence walls are generally replacing existing boundary features, rather than the introduction of new features into the landscape. The effect these have on the landscape will essentially be driven by the quality and appropriateness of the detailing; a 'good fit' can be achieved with the opportunity for some enhancement by the simplification of details and removal of visual clutter. This is being provided by ensuring new walls are primarily brick clad to match the existing vernacular.

The walls will mostly be clad with brick except at one location, being where the wall ties into the Scheduled Monument on the western side of the River Ancholme. This will be textured concrete to match existing parapet wall and any fittings will be painted green. The wall over the East Drain will also not be clad and will be concrete.

Negative visual effects will occur during construction. Receptors north of Sluice Road and users of PRow that cross the site are most sensitive to construction activity. During operation the effect of the Scheme is reduced to moderate / slight given the nature of the proposals.

Proposed mitigation and enhancement measures include additional habitat creation such as a proposed area of woodland, gapping up of existing hedges, profiling of a new ditch for water vole habitat creation, hibernaculums and NVC MG5 grassland (unimproved neutral grassland).

Proposed soft flood defences allow for the development of intertidal habitat to contribute for the loss arising from coastal squeeze. The network of drains, ditches and dykes will be conserved and enhanced where possible so that they form effective habitats. Proposed information boards will help to raise awareness of the local heritage and importance of the roosting and feeding areas for birds around the estuary, ensuring that they are adequately protected and managed. These proposed enhancements contribute to the aims and opportunities as detailed in The Humber Estuary NCA 44 character area profile.