Appendix A: Background Cultural Heritage Context

Archaeological Sites

The East Riding, and the c.980sqkm selected for the SEA Addendum study area, has been shaped by man's activities over the past 10,000 years. As a result, the area contains a rich heritage of archaeological sites (both designated and non-designated), dating from the early prehistoric periods to the 20th century, which reflect the region's varied social and economic history.

The Prehistoric Periods (up to c.700 BC)

The earliest phases of prehistoric occupation are generally characterised by an increasing exploitation of the natural landscape and its resources. Artefactual evidence suggests that there was a human presence in Holderness during the Palaeolithic period, and several sites have been identified within the River Hull corridor; one flint-working site at Brigham was excavated in 1962-63 in advance of gravel extraction. Climatic improvements after the Devensian ice age led to the re-establishment of forests, and plants and animals became available for exploitation. While Holderness saw some transient human activity in the later Mesolithic period (c.8300-4000 BC), there was also a significant population on the Wolds, centred on 'activity areas' associated with ponds and springs.

The number and density of sites on the Wolds implies that this higher land was well-populated during the subsequent Neolithic period (c.4000-2500 BC). Although initially a pastoral society, the gradual introduction of grain crops resulted in a more widespread mixed agricultural regime. The construction of large communal burial mounds as well as other sacred or ritual sites, such as henges, cursus and mortuary enclosures, suggests that there was an organised, community-based society. The recovery of polished flint and stone axes, together with smaller flint tools, from the lower ground of Holderness implies that activity was also significant in these areas. Recent fieldwork has identified ten new Neolithic sites in the Hull valley, all associated with the river and located on till outcrops.

The numerous cropmarks, earthworks and artefacts that survive from the Bronze Age (c.2500-800 BC) show that the Wolds continued to be occupied, with continued forest clearance. Over time, a more stratified society developed, which is reflected in the spread of individual, rather than communal, burial practises in round barrows. The long linear earthwork boundaries, which have been traced for considerable distances across the Wolds, originated in this period, and were probably used to define agricultural estates or territories; most of these boundaries are now ploughed out, but isolated upstanding sections can be seen in Huggate and Millington parishes. The widespread distribution of Neolithic and Bronze Age pottery, as well as other artefacts, shows that an extensive trading network had been established by this time.

Climatic deterioration from about 1200 BC meant that agricultural production could no longer support the expanding population, and the need to gain and protect land led to the growth of a warrior society and the accelerated development of bronze weapons. Defended settlements became more common, and their distribution within the large linear boundaries suggests an early phase of territorial development. However, there is also some evidence for unenclosed settlement during this period, often associated with trackways and small paddocks. The Bronze Age is also well represented in Holderness and the Hull Valley, mostly by round barrows and ring ditches now visible as cropmarks, and by the numerous implements and other artefacts that have been recovered. It should also be noted that the low-lying ground in the centre and east side of the study area has a considerable palaeo-environmental resource, and the study of the wetland deposits such as the peats, silts and clays provides important information on prehistoric environments and climatic conditions.

Appendix A: Background Cultural Heritage Context

The Iron Age and Romano-British Periods (800 BC-c.410 AD)

Several types of Iron Age and Romano-British occupation have been identified from the cropmark evidence, suggesting that the study area, and the higher western half in particular, was a densely settled and intensively farmed landscape at this time. Almost all of the sites survive below ground, and can now only been seen as cropmarks from the air. Sites vary in size from discrete and scattered enclosures containing one or more large huts to groups of two or three co-joined or closely spaced enclosures, all within their own field systems. Many of the enclosures form long linear complexes arranged along a trackway or at junctions of linear boundaries. These 'ladder settlements' are characteristic of the East Riding archaeological landscape, and they can extend for over 1.5km and exhibit several phases of expansion and contraction. They probably represent a more centralised, nucleated form of settlement, and many exhibit continuity of occupation into the Roman period. Within the study area, buried examples are preserved at Garton Slack and Blealands Nook to the north-east of Wetwang. The Iron Age (c.800 BC-AD 71) is also characterised by small square barrows grouped in large and small cemeteries. Many have been identified on the Wolds, for example near Kilham and Middleton-on-the-Wolds, with outlying examples at Scorborough and on the Beverley Westwood. Occasional examples include rare 'chariot' (more correctly termed cart) burials, for example one recently found on a housing development in Wetwang.

Holderness does not appear to have been as densely occupied and farmed during this period, although this is more likely to be a reflection of poor cropmark generation and a lack of previous research rather than any real absence of remains. Some important sites or complexes have been identified in the Hull valley, for example at Gransmoor and Little Kelk, and around Wansford and Skerne. It is also known that the lower parts of the Hull valley were comparatively well settled at this time, and the river appears to have been an important transport route.

The Romans invaded the area in c.AD 71, and established a military base and harbour at Brough (*Petuaria*). The surrounding landscape was settled and farmed, and villa sites and their estates have been identified at several places on the Wolds; one lies near Harpham. Many of the native Iron Age nucleated villages also continued to be occupied well into the Roman period. A fall in sea levels provided opportunities for new settlements to be established in Holderness, and several Roman sites have been identified along the Hull corridor, for example around Skerne, Eske and Weel, as well on the northern and eastern edges of Hull; many of these settlements lie on or above the 10m contour.

The Anglo-Saxon Period (c.410-1066)

Although Roman forces were withdrawn from East Yorkshire in AD 410, there is evidence that some of the villas and settlements on the Wolds continued to be occupied, and that some of the earlier Neolithic and Bronze Age barrows and earthworks were reused for burials. The known settlements and cemeteries of the Anglo-Saxon period tend to cluster around the edge of the Wolds, suggesting that the higher land was given over to pasture linked by a series of long distance trackways; some of these routes survive as parish or township boundaries or as green lanes, for example in Tibthorpe and Sledmere parishes. Conversely, environmental evidence suggests that there was a major marine transgression in the 4th century AD which led to the widespread abandonment of settlements in Holderness.

Place-name elements have often been used to provide clues as to the distribution of settlement and ethnic groups between the 4th and 9th centuries, and it is clear that many villages and towns in the study area have their origins in the Anglo-Saxon period. However, little physical evidence usually

remains, primarily due to subsequent development. Cottam, Nafferton, Goodmanham, Beverley and Driffield are among those considered to be important sites, with the latter possibly developing into a royal centre by the early 8th century. Numerous early Anglo-Saxon cemeteries have also been identified on the western Wolds, while in the Hull valley a wooden bridge and gravel causeway of middle Saxon date was excavated at Skerne in 1982.

The Medieval and early Post-medieval Periods (1066-1750)

The East Yorkshire landscape is rich in sites of this era, although many have been lost to agricultural improvement and development. The existing villages tended to expand at the start of the Middle Ages, and many churches were either built or extended. A large number of villages and their associated field systems were deliberately created by the medieval overlords, as a way of increasing income and expanding the areas under cultivation. These villages are characterised by a planned layout of regular plots and parallel back lanes, although many villages contain some planned elements within an apparently haphazard layout. Other settlements were created for specific purposes, for example Wyke, later to become Kingston-upon-Hull, was founded by Meaux Abbey in the mid 13th century for the export of monastic wool. Large areas of the countryside were given over to open fields, divided into individually-owned strips but farmed on a communal basis. On the Wolds, many of the prehistoric burial mounds and field systems were ploughed up for the first time.

Towards the end of the Middle Ages, a number of villages shrank in size or were abandoned, to leave the characteristic earthworks of house plots and field systems. This process is generally associated with changing economic fortunes and climatic conditions, and the numerous examples across the Wolds include Huggate, Garton, Cottam, Towthorpe, Eastburn and Sunderlandwick. Other low-lying deserted villages in the Hull valley and Holderness include Eske, Rotsea, Raventhorpe and Burton Constable. Isolated areas of ridge and furrow earthworks, representing areas of former arable cultivation, also survive around some existing villages and farms. The rapid erosion along the Holderness coastline also means that many medieval villages have been swept away. Most of the villages in the Hull valley are sited on the higher, drier, land away from the floodplain, and several are associated with early river crossings, for example Eske, Brigham and Wawne. The carr land, bordering the river, was often flooded for long periods of time, but this area was valued for its fishing, grazing and wildfowl, while reeds, turf and peat were regularly harvested.

The medieval period is also characterised by fortified or defended sites. There are three motte and bailey castles in the study area (at Driffield, Swine and Lockington), as well as numerous moated sites surrounding domestic, religious, manorial and agricultural buildings. Moats surround important manorial centres at Cottingham, Lockington, Burstwick and Leconfield, for example, while many others lie within or on the edges of medieval villages. Isolated low-lying examples in Holderness tend to represent the gradual expansion of settlement into the wetter and poorer agricultural land. Deer parks were another important feature of the medieval landscape, created as private hunting reserves by the nobility. These frequently contained lodges and areas of woodland, and were surrounded by a substantial bank and ditch. Most parks have since been broken up and returned to agriculture, for example at Leconfield, although some have survived to form the core of later landscaped parks (see below). Both Beverley and Hull were defended medieval towns, Beverley being surrounded by a bank and ditch with brick-built bars or gates to control access. Hull was founded in 1293 by Edward I as a port, and the 'Old Town', on the west side of the River Hull, had its defences rebuilt in brick in the late 14th century. Both towns, as well as other smaller settlements such as Driffield and Cottingham, have revealed much of their medieval and later history as a result of development-led excavation.

Appendix A: Background Cultural Heritage Context

The study area contains much evidence for monastic activity, through either the sites of the monastic complex or as outlying estates controlled by a system of granges. One of the largest of the monasteries was the Cistercian house at Meaux, founded in the mid 12th century, which had extensive sheep pastures on the Wolds; the monks were also responsible for the first serious attempt to drain parts of the Hull valley to improve agricultural productivity and communication. Other well-preserved earthworks of a Cistercian monastery survive at Swine and a rare double house of nuns and monks was founded by the Gilbertines in c.1150 at Watton. Augustinian priories were established at Warter, North Ferriby and Cottingham (subsequently moved to Haltemprice) and there were Benedictine nunneries at Nunburnholme and Nunkeeling. Both Hull and Beverley also contained a large number of houses associated with the mendicant orders such as the Dominicans, Franciscans and Carmelites.

Post-medieval Landscape, Trade and Industry (1750 onwards)

The process of enclosure involved a change from the communal farming of the open field systems around the villages to the creation of regularised, individually owned or tenanted fields grouped around a farm. Most of the higher Wolds were enclosed by Parliamentary Act, as evidenced through large rectangular fields, broad straight roads with wide grass verges, and substantial isolated farm complexes surrounded by shelter belts; these enclosures tend to date from the late 18th and early 19th centuries. Over the southern part of the Wolds and in Holderness the process was more complex. Although large areas were enclosed by agreement before the late 16th century, more enclosure took place in the 17th century, and these areas are characterised by a more curvilinear and less regularised field pattern. Neighbouring townships were often enclosed at different times and the differential phases can be seen in the sizes, shapes and orientations of the resulting field boundaries and the distribution of farmsteads. Later enclosure also tended to concentrated on the draining and clearing of marginal land, for example along the Hull valley. Unfortunately, modern farming regimes mean that field boundaries and patterns are slowly becoming lost.

Enclosure was also a means by which marginal land, pasture, meadow or common could be brought into cultivation. Small-scale drainage works were undertaken in the Hull valley in the 17th century, for example at Brandesburton and Wawne, but it was not until the later 18th century that more widespread schemes were able to be implemented. The Holderness Drainage Board was established in 1763 and the Beverley and Barmston Drainage Act was passed in 1798. New channels were dug to allow water from north Holderness to drain east to the sea, while flooding in the Hull valley was alleviated by the Beverley and Barmston, and the Holderness, Drains. The Beverley and Barmston Drain, completed in 1810, was dug parallel to the west side of the River Hull with a new outfall at Wincolmee in Hull. The Holderness Drain lay further to the east, and its first phase was completed in 1772, with a second phase in 1805 and an outfall at Marfleet in 1832. Both drains incorporated raised flood banks, sluices, pumping stations and numerous road bridges and culverts.

The rural nature of most of the study area means that many post-medieval industries were connected with the processing of agricultural produce, such as milling, malting, tanning and textiles. Mills, using either water or wind as power, were especially numerous, although only a small number now survive and even fewer retain their working machinery, for example at Skidby and Beswick. Brick making was also a significant rural industry, using the naturally occurring clays of Holderness and the Hull valley as a raw material. Other industries, such as brewing, malting and tanning, tended to be concentrated in the major urban centres such as Beverley, although there were also smaller concerns in some villages. Beverley also became an important centre for wool processing and textile manufacture and, until the 13th century and the growth of Hull, was the only large port in the Hull valley.

The movement of raw materials and finished goods was made easier as communication improved. The existing road network was improved through a system of 18th century turnpikes, with Hull and Beverley being focal points. Inland waterways, whether navigations, improved rivers or purpose-built canals, were created at the same time, although some, such as the Beverley Beck, date from the medieval period. The River Hull had also been used from the medieval period, but the alignment was improved and extended as part of the construction of the Driffield Navigation which opened in 1770. However, it was the construction of the railways that allowed the East Riding to trade on a national scale. The Hull to Selby line opened in 1840 and was one of the earliest routes in the country. Other lines to the west and north through the Wolds and to the coast soon followed, and by the late 19th century the North Eastern Railway had a monopoly on traffic. This was challenged in the 1890s by a new line from Hull to the West Riding, which terminated at newly created docks in Hull. Some parts of Hull's dock system date to the later 18th century, but by the 1850s they encircled the 'Old Town', effectively stifling urban expansion so that the core became increasingly cramped and squalid. By the turn of the 20th century however, outward growth had been dramatic and the city become the most important port and manufacturing centre in the area.

Post-medieval Military Sites

Being a coastal county, East Yorkshire contains a large number of military sites, both defensive and offensive, associated with the two World Wars, and some of these lie within the study area. There were several First World War batteries along the coast and the Humber, but the greatest number of the military sites are those associated with the Second World War. Although many airfields have now been ploughed out and returned to agriculture, for example at Cottam, some remain and important structures can be seen at Driffield and Brandesburton. Hull was a prime air target during the Second World War, and several decoy towns and ports were built in the surrounding rural areas, for example at Aldbrough and Preston. Some of the larger airfields also had their own decoys, for example Driffield which had decoys at Skipsea and Skerne. Several searchlight and anti-aircraft batteries also survive around Beverley. In terms of defensive structures, there are many examples of pillboxes, anti-tank cubes and anti-landing ditches in the study area, as well as a significant number of 'resistance sites' which were to act as guerrilla bases should the country be invaded.

Built Heritage

The East Riding has a significant and important built heritage, comprising both designated and non-designated sites. The lack of good quality building stone and timber over much of the area, together with readily available clay, meant that brick was used from the early 14th century, although locally-sourced chalk from the Wolds and cobbles from the beaches and fields in Holderness were also used. The most significant buildings are of brick, for example the North Bar in Beverley (1409-10), Holy Trinity church in Hull (mainly 14th century) and Watton Priory gatehouse (15th century), and by the 17th century brick was the dominant building material of the East Riding. Other more prestigious medieval buildings, for example Beverley Minster and the principal churches, relied on stone brought from elsewhere, and some timber-framed structures survive in the towns. Until the 18th century, most rural buildings were single storey structures of mud and thatch, or with timber frames supported on chalk foundations. These were later rebuilt using brick and pantiles; the shaped or tumbled gables (triangular wedges of brickwork) are characteristic of the East Riding's architectural heritage. Although these buildings appear superficially plain, many show a surprising degree of architectural complexity.

Some of the earliest structures in the study area date from the medieval period, for example churchyard crosses and grave slabs. Several rural medieval churches remain more-or-less intact, for example at Skirlaugh, although many were heavily restored or rebuilt during the Victorian period; one of the best examples of the latter is that at Garton-on-the Wolds which contains an impressive

Victorian interior. Beverley Minster, the largest medieval church in the East Riding, mostly dates from between 1220-1400 and incorporates three styles of Gothic architecture, while other significant large medieval churches include Holy Trinity in Hull and St Mary's in Beverley.

There are several country houses in the study area. Burton Constable Hall is a large and complex structure, medieval in origin but mostly 16th-17th century in date. Other important houses of this period include Beswick Hall, Brandesburton Hall, Elmswell Old Hall and Southwood Hall in Cottingham. Sledmere House on the western edge of the Wolds, is one of the best examples of a late 18th century house, although it was sympathetically restored and remodelled after a fire in 1911. The noted regional architect John Carr was responsible for many fine houses in the East Riding, and many were surrounded by designed landscapes incorporating parks and gardens.

Two distinct types of village can be seen in the East Riding. The 'closed' or estate village is a characteristic of areas controlled by the large landowning families of the 18th and 19th centuries, for example the Sykes family of Sledmere. These villages are noted for their estate houses, churches, schools, almshouses and farms, with many buildings having their own architectural styles and a uniformity of design. Other estate villages include Warter, Swine, South Dalton, Everingham and Howsham, and these contain a high proportion of Listed Buildings. These planned settlements contrast sharply with the 'open' villages, where there were fewer constraints on development and freeholders were able to rebuild their houses and provide speculative housing for agricultural labourers, for example at Nafferton, Hutton Cranswck and Barmby Marsh.

Many of the enclosure-period farmsteads are substantial complexes, often incorporating threshing barns, workers housing, fold yards, dovecotes, engine houses and double-pile two-storey farmhouses, all surrounded by shelter belts and plantations. These farms form prominent features in the landscape, especially on the Wolds, but largely unaltered examples are now rare. Many of the outlying structures no longer serve a purpose, or have been adapted to fulfil different agricultural needs.

The Victorians also built a large number of new churches and chapels. Many of these are important landmarks in the area, for example the spire of St Mary's Church at South Dalton and its half-size replica (St Leonard's Church) at Scorborough. Almost every East Riding village also contains a Nonconformist chapel, either of Baptist, Methodist, Wesleyan or Primitive denomination; some of the best survivors include those at Hessle (1813), Long Riston (1837) and Wansford (1865), although many have been demolished or converted; some Italianate examples are particularly impressive, for example those in Cottingham and Beverley.

Early 20th century architecture has also made its mark, and several structures have become landmarks in their own right. Within the urban parts of the study area, these include the University of Hull buildings (begun 1928), Hull's Town Hall (1904-16) and City Hall (1903-09). More modern structures are represented by Perronet Thompson School in Bransholme (now Kingswood Academy) (1987), the Tidal Surge Barrier at the mouth of the River Hull (1980), Princes Quay shopping centre (1987-90) and The Lawns student accommodation in Cottingham (1963-66). The City of Hull in particular contains numerous examples of several 19th-20th century architectural styles.

Registered Parks and Gardens

There are several important 18th century landscape parks surviving in the East Riding as well as the remains of earlier formal gardens; some of these are designated sites but many are not. In the study area, formal garden remains have been identified at Risby, where prominent terraces and other

earthworks now mark the site of a late 17th century house and its gardens. Earlier late medieval gardens are also becoming recognised, for example at Burton Constable. The major medieval houses of the time would also have been surrounded by a designed landscape incorporating gardens, deer parks and water bodies, for example those at Burton Constable and Leconfield.

Lancelot 'Capability' Brown had a number of patrons in the East Riding, and within the study area he proposed or advised on works at Burton Constable, Rise and Sledmere. In some cases, existing villages were wholly or partly removed to facilitate the construction of a new park, while there are many examples of roads being closed or diverted. The most often quoted example of park creation is that of Sledmere, where Sir Christopher Sykes replaced an earlier medieval village with a handful of new structures near the new Hall and two groups of cottages further away, and established new plantations and estate farms, all in the late 18th century. Other notable garden designers known to have worked on grounds in the study area include Brown's foreman Thomas White (at Burton Constable and Sledmere) and Adam Mickle (Walkington Lodge).

Many of the former landscaped grounds in the study area have now been lost to agriculture and development, for example at Kilnwick-on-the Wolds and Benningholme Hall, and 'urban' grounds and gardens such as Kingtree House in Cottingham and Lairgate Hall, Norwood House and Newbegin House in Beverley. However, other important landscaped grounds survive, in varying states of completeness, as reflected in the five designated Registered Parks and Gardens. Late 19th century or early 20th century urban parks can also be found in Hull, for example East Park, Queen's Gardens, Pickering Park and Pearson Park.

Appendix B: Updated Planning Appraisal Table

Plan/Programme/strategy	Description/Purpose	Relevance to/Influence over River Hull FRM Strategy	Integration with River Hull FRM Strategy
National Planning Policy Framework (NPPF) 2012 **National Planning Policy Framework – Technical Guidance** (Flood Risk and Minerals)	The NPPF was introduced in 2012 and replaced a tranche of documents considered in the original SEA including PPS1, PPS1 Climate Change supplement, PPS3, PPS4, PPS5, PPS7, PPS9, PPS25, PPS25 Supplement, and PPG17. The NPPF sets out the government's approach to the delivery of the planning system. It provides guidance on the economic, social and environmental roles of planning. It identifies the purpose of planning is to '*help achieve sustainable development*'. The NPPF streamlines the planning system and distills its guidance into a single document, but that should not be interpreted as being recognition that the importance of the constraints to planning are in any way diminished. It establishes the approach to key issues in the context of 'plan making' and 'decision taking' within the following: • Section 10 - *'meeting the challenge of climate change'* requires plans, and planning decisions to take account of flood risk as a key issue and the implications for climate change and steering development to	The NPPF outlines that the role of planning is to deliver sustainable development taking into account the challenges facing the planning system both in the context of directing and controlling development patterns and in dealing with the physical, social, economic and environmental challenges for the planning system.	The Strategy is compliant with the purpose the government identifies for the planning system within the NPPF. Section 10 of which requires that planning plays a key role in shaping the places '*by minimising vulnerability and providing resilience to the impacts of climate change'.* In the case of development, and the location of development the NPPF requires a risk based approach to the issue of flooding and flood risk. The River Hull FRM strategy applies a consistent spatial approach to the issue, taking account the wider implications of the rivers catchment area, and in presenting an opportunities/constraints approach to the issue of flood risk, that can and will integrate with other policies to provide a structured assessment of and approach to flood risk in the area that will aid and inform the future development within the study area. It is considered that the River Hull FRM Strategic will provide essential guidance and input to the baseline assessments for development that will have implications for the key objectives of the NPPF across sections 10, 6, 1,2, &3, 12, and 11. Flood risk and climate change has implications for all these areas of planning and their appropriate assessment. The aims of the River Hull FRM Strategy can be considered to support the objectives of the NPPF through all these scenarios by managing flood risk or by mitigating its impacts to help to deliver sustainable

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	areas of lesser risk whilst promoting renewable low carbon energy. • Section 6 – '*delivering a wide choice of high quality homes'* The NPPF plays a key role in encouraging the growth of housing supply with development located in environmentally safe and sustainable locations. • Section's 1, 2 and 3 '*supporting a strong competitive economy'* - across economic sectors. The government is committed to securing economic growth through the consolidation of existing clusters of activity and encouraging growth through the continued supply of land for economic development, whilst at the same time promoting the rural economy towards sustainable growth • Section 12 '*Conserving and enhancing the historic environment'* the Framework makes it clear that growth should not be achieved to the detriment of the historic environment, local authorities are required to recognise that heritage assets are an		development located in the right place and suitable for the right use. It aims to support the delivery of housing, industry and employment whilst minimizing its impacts on the historic and natural environment by providing technical support to land use planners in the interpretation of flood risk as a material consideration on the issue of flood risk.

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	irreplaceable resource and must be preserved through the planning process. This equally applies to thereat form development pressure and climatic environmental change. • Section 11 '*conserving and enhancing the natural environment'* – the NPPF in this section recognizes the importance of the natural environment and the need for the planning system to use natural resources prudently, minimizing waste and pollution by adapting to climate change and moving to a low carbon economy. The planning system is expected to contribute to protecting and enhancing valued landscapes, geology and wider ecosystems. This should be achieved by minimizing the effects of development or land use related impacts on the local and natural environment. These threats are not just from development but can be caused by insensitive changes to ecosystems and inappropriate infrastructure or land uses.		
East Riding Local Plan –	The Strategy Document sets out the key	The vision set out in the Strategy, and	The River Hull FRM Strategy influences significant

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Proposed Submission Strategy Document January 2014	proposal for the East Riding with development control policies to promote sustainable development, manage the scale and distribution of new development to achieve a healthy well balanced housing market, prosperous economy high quality environment and strong healthy community	allocation's Documents aim to create a vibrant sustainable urban and rural community that promotes growth while protecting the historic and natural environments to maximize quality of life	parts of the area, and supports the vision and objectives that the plan promotes, by seeking to identify and mitigate flood risk in the River Hull study area, and to minimise flood risk to existing development whilst influencing the location of new development to minimise risk.
PPS 1: including Climate Change Supplement	Replaced by NPPF		
PPS 3	Replaced by NPPF		
PPS 4	Replaced by NPPF		
PPS 5	Replaced by NPPF		
PPS 7	Replaced by NPPF		
PPS 9	Replaced by NPPF		
PPS 25: including Supplement	Replaced by NPPF		
PPG 17	Replaced by NPPF		
Yorkshire & Humber Plan – The Regional Spatial Strategy	Abolished		
Joint Structure Plan (JSP) for Kingston upon Hull and the East Riding of Yorkshire (June 2005)	Current status uncertain; at least one policy may still have validity but is not considered appropriate to decision or plan making		
Hull City Council Core Strategy Emerging Preferred Approach (February 2010)	Withdrawn 2013 replacement Local Plan in preparation		
East Riding Core Strategy Issues and Options Draft (April 2008)	Replaced with 'East Riding Local Plan – Proposed Submission Strategy Document January 2014' noted above		
Joint Minerals DPD Issues and Options Draft (April	Now updated to Proposed Submission Strategy 2014		

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2008)			
All other plans, programmes and strategies as listed in the original SEA of 2010 remain valid			

Appendix C: Strategic Water Framework Directive Assessment

Introduction

A Water Framework Directive (WFD) Assessment has been undertaken for the River Hull Integrated Catchment Strategy (RHICS) as an element of the Strategic Environmental Assessment (SEA) Addendum report for the strategy.

Assessment examines the potential effects of the proposed scheme on ecological quality of receptor waterbodies. Effects which are likely to reduce the possibility of meeting WFD objectives or otherwise cause deterioration in the status of downstream waterbodies are identified and assessed.

Each Option within RHICS has the potential to impact on WFD waterbodies either directly (if the intended operations take place on a WFD waterbody) or indirectly (downstream receptors).

Context

The WFD has been in force since 2000 and is currently the most influential piece of European Union (EU) legislation relating to the water environment. All new and ongoing activities in the water environment are required to be guided by the requirements of the WFD.

The EU Water Framework Directive was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The Directive requires that Environmental Objectives be agreed for all surface and ground waters in England and Wales enabling waterbodies to achieve Good Status (or Good Ecological Potential for Heavily Modified Waterbodies) by a defined date. Environmental Objectives are listed below:

- prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- aim to achieve at least good status for all waterbodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027;
- meet the requirements of Water Framework Directive Protected Areas;
- promote sustainable use of water as a natural resource;
- conserve habitats and species that depend directly on water;
- progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and,
- contribute to mitigating the effects of floods and droughts.

Appendix C: Strategic Water Framework Directive Assessment

RHICS options are located in the Humber River Basin District. Environmental Objectives and specific actions necessary to enable waterbodies to meet these objectives are detailed in the Humber River Basin Management Plan (RBMP).

Preventing Deterioration in Status

Any activity which has potential to impact upon ecological functioning of a waterbody should be assessed against WFD objectives. In particular the likelihood that activities have the potential to cause deterioration in the Ecological Status or Potential of a waterbody.

Where works are on minor waterbodies which discharge into larger waterbodies, WFD Assessment is necessary to allow examination of cumulative impacts on downstream receptor waterbodies. This ensures that the scheme does not compromise achievement of WFD objectives in other waterbodies in the same River Basin District.

For each waterbody, three different status objectives are identified in the River Basin Management Plan (RBMP); the overall status objective, the ecological status or potential objective and the chemical status objective. A default objective for all waterbodies is to prevent deterioration in Ecological Status of the waterbody (or Ecological Potential for Heavily Modified or Artificial Waterbodies).

The Ecological Status of a waterbody is determined through analysis of its constituent biological Quality Elements (listed below). These elements are in turn supported by a series of physio-chemical and hydro-morphological Quality Elements. These Quality Elements are taken from Annex V of the Directive. The overall Ecological Status is determined by the lowest element status.

Biological Quality Elements

- fish;
- invertebrates;
- macrophytes; and
- phytobenthos.

Any activity that has the potential to have an impact upon any of the Quality Elements is considered in terms of whether it could cause deterioration in the status of a waterbody and whether impacts due to the works are likely to compromise the ability of the waterbody to reach Good Ecological Status or Good Ecological Potential by the date specified in the RBMP.

Artificial or Heavily Modified Waterbodies

Good ecological status is defined as a slight variation from undisturbed natural conditions in natural waterbodies. Artificial and heavily modified waterbodies are unable to achieve natural conditions. Instead, artificial and heavily modified waterbodies have a target to

achieve Good Ecological Potential, which recognises their important uses, whilst making sure ecological functions are protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad, and chemical status of these waterbodies is measured in the same way as for natural waterbodies.

Specific mitigation measures have been identified for each Artificial and Heavily Modified Waterbody and are listed in the RBMP. These mitigation measures are necessary to reduce the existing hydro-morphological impacts on the waterbody and all measures need to be in place in order for the waterbody to achieve Good Ecological Status or Potential.

SEA Options

Each Option (A-G) is described in the SEA Addendum report; see sub-section 6.2.

For each Option WFD Receptors have been identified using the RBMP as tabulated below.

Table 1 WFD Receptors

Options with potential to effect on WFD receptor	**Waterbody ID and name:**
C	GB104026066950 Holderness Drain Source to Fordyke Stream
C, D	GB104026066800 Holderness Drain from Fordyke Stream to Humber
G	GB104026067130 Garton Wold / Water Forlorns
G	GB104026067060 Driffield Trout Stream
G	GB104026067080 West Beck Upper
G	GB104026067040 West Beck Lower to River Hull
E, F, G	GB104026067000 River Hull from West Beck to Arram Beck
E, F, G	GB104026066870 Arram Beck 1
A, B, E, F, G	GB104026067210 River Hull from Arram Beck to Humber
A, B, C, D, E, F, G	Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk
A, B, C, D, E, F, G	GB530402609201 T1 Humber Lower
A, B, C, D, E, F, G	GB530402609202 T2 Humber Middle

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The waterbodies with WFD objectives are identified above, and full details are available in the on-line Humber River Basin Management Plan (RBMP) Annex B: Objectives for Waters, however relevant sections are tabulated below.

Table 2 below summarises the description of each waterbody, and Tables 3 and 4 list biological and other supporting elements. Table 5 then summarises other factors contributing to the assessment of the waterbodies being examined.

Finally, Table 6 below indicates the overall ecological potential of each waterbody.

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Table 2 Waterbody description

Waterbody ID and name:	Current overall potential	Status objective (overall):	Ecological Status objective:	Other Status objectives:	Hydro-morphological designation	Reason for designation
GB104026066950 Holderness Drain Source to Fordyke Stream	Moderate	Good by 2027	Good Ecological Potential by 2027	NA	Artificial	Land drainage
GB104026066800 Holderness Drain from Fordyke Stream to Humber	Moderate	Good by 2027	Good Ecological Potential by 2027	NA	Artificial	Land drainage
GB104026067130 Garton Wold / Water Forlorns	Moderate	Good by 2027	Good Ecological Potential by 2027	NA	Heavily modified	Flood protection
GB104026067060 Driffield Trout Stream	Poor	Good by 2015	Good Ecological Status by 2015	NA	Not designated	NA
GB104026067080 West Beck Upper	Moderate	Good by 2027	Good Ecological Potential by 2027	NA	Heavily modified	Flood protection
GB104026067040 West Beck Lower to River Hull	Moderate	Good by 2027	Good Ecological Potential by 2027	Good Chemical Status by 2015	Heavily modified	Urbanisation
GB104026067000 River Hull from West Beck to Arram Beck	Moderate	Good by 2027	Good Ecological Potential by 2027	Good Chemical Status by 2015	Artificial	Drinking water, Land drainage

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Waterbody ID and name:	Current overall potential	Status objective (overall):	Ecological Status objective:	Other Status objectives:	Hydro-morphological designation	Reason for designation
GB104026066870 Arram Beck 1	Moderate	Good by 2027	Good Ecological Potential by 2027	NA	Artificial	Land drainage
GB104026067210 River Hull from Arram Beck to Humber	Moderate	Good by 2027	Good Ecological Potential by 2027	NA	Artificial	Land drainage
Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Poor	Good by 2027	NA	Good Quantitative Status by 2027, Good Chemical Status by 2027	NA	NA
GB530402609201 T1 Humber Lower	Moderate	Good by 2027	Good Ecological Potential by 2027	Good Chemical Status by 2027	Heavily modified	Flood protection, navigation.
GB530402609202 T2 Humber Middle	Moderate	Good by 2027	Good Ecological Potential by 2027	Good Chemical Status by 2027	Heavily modified	Flood protection

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Table 3 Biological elements

Waterbody ID and name:	Fish			Invertebrates			Macrophytes			Phytobenthos		
	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015
GB104026066950 Holderness Drain Source to Fordyke Stream	NA	NA	NA	Poor	Poor	Not required.	NA	NA	NA	NA	NA	NA
GB104026066800 Holderness Drain from Fordyke Stream to Humber	Good	Good	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB104026067130 Garton Wold / Water Forlorns	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB104026067060 Driffield Trout Stream	Poor	Good	NA	Moderate	Good	NA	NA	NA	NA	NA	NA	NA
GB104026067080 West Beck Upper	Poor	Good	NA	Poor	Good	NA	NA	NA	NA	NA	NA	NA
GB104026067040 West Beck Lower to River Hull	Moderate	Good	NA	Moderate	Good	NA	NA	NA	NA	NA	NA	NA

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Waterbody ID and name:	Fish			Invertebrates			Macrophytes			Phytobenthos		
	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015
GB104026067000 River Hull from West Beck to Arram Beck	Moderate	Good	NA	High	High	NA	Moderate	Good	NA	Good	Good	NA
GB104026066870 Arram Beck 1	Good	Good	NA	Good	Good	NA	NA	NA	NA	NA	NA	NA
GB104026067210 River Hull from Arram Beck to Humber	Good	Good	NA	Moderate	Good	NA	NA	NA	NA	NA	NA	NA
GB530402609201 T1 Humber Lower	Good	Good	NA	Moderate	Moderate	Not required	NA	NA	NA	NA	NA	NA
GB530402609202 T2 Humber Middle	Good	Good	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 4; Supporting elements where these are a reason for current failure to meet WFD targets;

Waterbody ID and name:	Ammonia (Phys-Chem)			Dissolved oxygen			Ammonia (Annex 8)			Phosphate		
	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015
GB104026066950 Holderness Drain Source to Fordyke Stream	Poor	Poor	Technically infeasible	Poor	Poor	Technically infeasible	Poor	Poor	Technically infeasible	NA	NA	NA
GB104026066800 Holderness Drain from Fordyke Stream to Humber	Moderate	Moderate	Technically infeasible	Poor	Poor	Disproportion-ately expensive	Moderate	Moderate	Technically infeasible	NA	NA	NA
GB104026067130 Garton Wold / Water Forlorns	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB104026067060 Driffield Trout Stream	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB104026067080 West Beck Upper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB104026067040 West Beck Lower to River Hull	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Waterbody ID and name:	Ammonia (Phys-Chem)			Dissolved oxygen			Ammonia (Annex 8)			Phosphate		
	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015	Current status	Predicted by 2015	Justification if not good by 2015
GB104026067000 River Hull from West Beck to Arram Beck	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB104026066870 Arram Beck 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	Moderate	Moderate	Disproportion-ately expensive
GB104026067210 River Hull from Arram Beck to Humber	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 5; Other factors;

Waterbody	Other factors which restrict the waterbody's ability to meet WFD targets
GB104026066870 Arram Beck 1	Quantity and dynamics of flow currently has the status 'Does not support good'. Predicted status by 2015 is 'Does not support good' with the justification that this cannot be achieved as it is disproportionately expensive.
Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Quantitative / chemical status is poor due to saline intrusion (current status; poor, status in 2015; poor justification for failure to achieve; disproportionately expensive) and poor status of drinking water protected area (current status; poor, status in 2015; poor justification for failure to achieve; disproportionately expensive).
GB530402609201 T1 Humber Lower	Current status of dissolved inorganic nitrogen and tributyltin compounds is moderate and their predicted status by 2015 is moderate; justification for not achieving good status; disproportionately expensive for the former, and technically infeasible for the latter.
GB530402609202 T2 Humber Middle	Current status of dissolved inorganic nitrogen and tributyltin compounds is moderate and their predicted status by 2015 is moderate; justification for not achieving good status; disproportionately expensive for the former, and technically infeasible for the latter.

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Table 6; Overall Ecological Potential Assessment

Waterbody ID and name:	Current status	Predicted status by 2015	Justification for not achieving good status by 2015
GB104026066950 Holderness Drain Source to Fordyke Stream	Moderate	Moderate	Technically infeasible
GB104026066800 Holderness Drain from Fordyke Stream to Humber	Moderate	Moderate	Technically infeasible
GB104026067130 Garton Wold / Water Forlorns	Moderate	Moderate	Technically infeasible
GB104026067060 Driffield Trout Stream	Poor	NA	NA
GB104026067080 West Beck Upper	Moderate	Moderate	Technically infeasible, disproportionately expensive.
GB104026067040 West Beck Lower to River Hull	Moderate	Moderate	Technically infeasible
GB104026067000 River Hull from West Beck to Arram Beck	Moderate	Moderate	Technically infeasible
GB104026066870 Arram Beck 1	Moderate	Moderate	Technically infeasible
GB104026067210 River Hull from Arram Beck to Humber	Moderate	Moderate	Technically infeasible

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Waterbody ID and name:	Current status	Predicted status by 2015	Justification for not achieving good status by 2015
Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Poor	Poor	Disproportionately expensive
GB530402609201 T1 Humber Lower	Moderate	Moderate	Technically infeasible
GB530402609202 T2 Humber Middle	Moderate	Moderate	Technically infeasible

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Downstream Receptors

Downstream waterbodies with WFD objectives have been identified as detailed above, and ultimately all waterbodies in the catchment discharge into Humber Estuary.

Under the European Union Birds Directive of 1979 (79/409/EEC), Humber Estuary is designated as a Special Protection Area (SPA) for supporting populations of European importance of species listed on Annex 1 of the Directive and for supporting populations of European importance of certain migratory bird species.

Additionally in accordance with the Habitats Directive of 1992 (92/43/EEC) Humber Estuary is designated as a Special Area of Conservation (SAC). The relevant protected habitats are linked to the estuary and include mud flats, sand flats, lagoons, salt marshes, salt pastures, coastal sand dunes, sand beaches and fens.

Humber Estuary is also classified as a wetland of international importance, particularly for its populations of wintering and migratory birds, under the Ramsar Convention.

These three international designations are underpinned by UK designation of the estuary as Site of Special Scientific Interest (SSSI).

Whilst beyond the scope of this assessment, consideration should be given as to whether Appropriate Assessment is necessary. This would initially take the form of a Habitats Regulations Assessment undertaken by the competent authority to assess whether effects on the Humber Estuary are likely to be significant. If significant effects are considered likely, then Appropriate Assessment would be necessary.

Assessment Methodology

Humber RBMP and the Environment Agency's web-based 'Flood Map' were used to determine which waterbodies could potentially be affected by RHICS. Names, ID numbers, designation, status classification and objectives for all relevant waterbodies were obtained from Annex B of the Humber RBMP.

The initial stage of the assessment screens the proposed flood scheme against the Ecological and Chemical Status objectives for the waterbodies potentially affected by the scheme, together with their Quality Elements. The aim of this process is to determine whether the scheme could have an impact upon any of these criteria. Those criteria for which no potential adverse effects are identified are not considered further in the assessment.

Detailed assessment is then undertaken to determine effects that the proposed flood scheme could have upon those Quality Elements screened into the assessment. Impacts identified are then considered in relation to the Ecological and Chemical Status of the waterbody and the status objectives. To aid this assessment, for all Artificial and Heavily Modified Waterbodies, the scheme is also assessed against their relevant mitigation

measures. These mitigation measures are designed to reduce existing hydro-morphological impacts on the waterbody and all measures need to be in place in order for the waterbody to achieve Good Ecological Status or Potential. The following assessment objectives are then used to determine whether the flood scheme complies with the overarching objectives of the WFD. These objectives are derived from the Environmental Objectives of the Directive.

- Objective 1: The proposed scheme does not cause deterioration in the Status of the Biological Elements of the waterbody;

- Objective 2: The proposed scheme does not compromise the ability of the waterbody to achieve its WFD status objectives;

- Objective 3: The proposed scheme does not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD; and

- Objective 4: The proposed scheme contributes to the delivery of the WFD objectives

If it is predicted that the scheme will cause deterioration in waterbody status or hinder a waterbody from meeting its ecological objectives, then an assessment is also made against the conditions listed in Article 4.7 of the WFD. Article 4.7 of the Directive defends deterioration in status or failure to meet WFD objectives resulting from new modifications or sustainable human development activities (if all conditions set out under this Article are met). Member States will not be in breach of this Directive if all the conditions are met. The results of the assessment are presented in tabular form below.

ASSESSMENT SCREENING

This initial stage of the assessment screens each Option against the Ecological Potential and Chemical Status for waterbodies potentially affected by the Option, together with their Quality Elements. The aim of this process is to determine whether the scheme could have an impact upon any of these criteria.

Relevant data from the RBMP for each waterbody is presented above. All waterbodies currently have overall potential of moderate or poor. The table below offers a brief description for each Option (a full description is present in the RHICS SEA text), potential impacts on the Ecological and Chemical status and supporting elements for relevant waterbodies are then described and the likelihood assessed.

Where impacts are assessed as being ‘unlikely’ or ‘highly unlikely’ the item is not considered further in this assessment. Where impacts are considered ‘likely’ or uncertain then further assessment is undertaken.

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Table 7; Assessment Screening

Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
A	Dredging of River Hull – water injection dredging (WID) mobilising sediment which is then carried downstream on tide and gravity. Removal of sunken vessels. Removal of riparian vegetation.	GB104026067210 River Hull from Arram Beck to Humber	Biological elements; fish and invertebrates Supporting elements; copper, zinc.	Likely	WID has the potential to mobilise pollutants in sediment as well as decreasing water quality due to increased sediment load.
		Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Saline intrusion and drinking water protected area.	Highly unlikely	There is no evidence that this option will cause any significant change in groundwater quality or rate of infiltration.
		GB530402609201 T1 Humber Lower		Unlikely	Sediment volumes generated by WID are considered not to constitute a significant increase in the context of sediment load of the Humber. Consequently changes are not considered

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
					likely to cause any significant change in biological elements or supporting chemical elements.
		GB530402609202 T2 Humber Middle		Unlikely	Sediment volumes generated by WID are considered not to constitute a significant increase in the context of sediment load of the Humber. Consequently changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
B	Hull tidal barrier – new mitre barrier and increased activation.	GB104026067210 River Hull from Arram Beck to Humber	Biological elements; fish	Uncertain	Increased activation of barrier may inhibit fish passage.

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
		Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Saline intrusion and drinking water protected area.	Highly unlikely	There is no evidence that this option will cause any significant change in groundwater quality or rate of infiltration.
		GB530402609201 T1 Humber Lower		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB530402609202 T2 Humber Middle		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
C	Holderness Drain – increased height of flood embankment in a portion of Holderness Drain and change in pumping regime to ameliorate detrimental higher	GB104026066950 Holderness Drain Source to Fordyke Stream	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
	peak water levels caused by increasing the height of flood embankments.				supporting chemical elements.
		GB104026066800 Holderness Drain from Fordyke Stream to Humber	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Saline intrusion and drinking water protected area.	Unlikely	There is no evidence that that this option will impact negatively on groundwater quality. Reduced infiltration due to reduced flooding is a predicted positive impact.
		GB530402609201 T1 Humber Lower		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB530402609202 T2		Highly	Changes are not considered

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
		Humber Middle		unlikely	likely to cause any significant change in biological elements or supporting chemical elements.
D	Bransholme Pumping Station – improved pumping capacity.	GB104026066800 Holderness Drain from Fordyke Stream to Humber	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Saline intrusion and drinking water protected area.	Unlikely	There is no evidence that this option will cause any significant change in groundwater quality or rate of infiltration.
		GB530402609201 T1 Humber Lower		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
					elements.
		GB530402609202 T2 Humber Middle		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
E	Beverley and Barmston Drain and Western Drain – raising sections of embankment.	GB104026067000 River Hull from West Beck to Arram Beck	Biological element - macrophytes	Unlikely	The changes are not considered likely to impact negatively on biological elements (fish or macrophytes) or supporting chemical elements in the medium to long term.
		GB104026066870 Arram Beck 1	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB104026067210 River	None	Highly	The changes are not

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
		Hull from Arram Beck to Humber		unlikely	considered likely to cause any significant change in biological elements or supporting chemical elements.
		Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Saline intrusion and drinking water protected area.	Unlikely	There is no evidence that that this option will impact negatively on groundwater quality. Reduced infiltration due to reduced flooding is a predicted positive impact.
		GB530402609201 T1 Humber Lower		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB530402609202 T2 Humber Middle		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
					supporting chemical elements.
F	Wilfholme and Hempholme Pumping Stations – replacement of pumps.	GB104026067000 River Hull from West Beck to Arram Beck	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB104026066870 Arram Beck 1	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB104026067210 River Hull from Arram Beck to Humber	None	Highly unlikely	The changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		Groundwater body G41 -	Saline intrusion and drinking	Unlikely	It is not considered likely

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
		GB40401G700700 Hull and East Yorkshire Chalk	water protected area.		that this option will impact on groundwater quality. Reduced infiltration due to reduced flooding is a predicted positive impact.
		GB530402609201 T1 Humber Lower		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
		GB530402609202 T2 Humber Middle		Highly unlikely	Changes are not considered likely to cause any significant change in biological elements or supporting chemical elements.
G	Upland management – natural flood management in Hull headwaters.	GB104026067130 Garton Wold / Water Forlorns	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
					chemical elements.
		GB104026067060 Driffield Trout Stream	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.
		GB104026067080 West Beck Upper	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.
		GB104026067040 West Beck Lower to River Hull	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.
		GB104026067000 River Hull from West Beck to Arram Beck	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
		GB104026066870 Arram Beck 1	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.
		GB104026067210 River Hull from Arram Beck to Humber	None	Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.
		Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	None	Highly unlikely	There is no evidence that this option will cause any significant change in groundwater quality, however, there is likely to be increased infiltration from pluvial sources.
		GB530402609201 T1 Humber Lower		Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting

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Option	Description	Waterbody	Elements potentially compromised in their ability to support good ecological potential by 2027 by this option.	Probability of adverse impact (without mitigation).	Rationale
					chemical elements.
		GB530402609202 T2 Humber Middle		Highly unlikely	The changes are not considered likely to impact negatively on biological elements or supporting chemical elements.

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Through the above screening process, the following Options have been identified as being likely to compromise the potential for WFD waterbodies to meet their WFD objectives in the absence of mitigation.

Option	Waterbody	Potentially compromised element.
A	GB104026067210 River Hull from Arram Beck to Humber	Biological elements; fish and invertebrates Supporting elements; copper, zinc.
B	GB104026067210 River Hull from Arram Beck to Humber	Biological elements; fish

All other options are considered unlikely or highly unlikely to have a significant adverse effect on the ability of impacted waterbodies to meet their WFD objectives.

Additionally where options can contribute to mitigation measures set out in the Humber RBMP, or there are opportunities for other positive ecological outcomes due to an option these are explored below.

ASSESSMENT, MITIGATION AND RESIDUAL IMPACT

Assessment

Assessment of the options against criteria screened in to the assessment is detailed in the following two tables. The first assesses the options against biological and physio-chemical quality elements of River Hull from Arram Beck to Humber with mitigation outlined and an assessment of residual impact made.

Assessment of Option A Dredging of River Hull against biological and physio-chemical quality elements of River Hull from Arram Beck to Humber

Scheme Component	**Biological and Physio-chemical Elements**		
	Physio-chemical Elements	**Fish**	**Invertebrates**
Removal of sunken vessels from River Hull	All chemical elements are currently reported as 'Good' or 'High', however, in the absence of mitigation it is likely that during removal of sunken vessels oil, diesel or other pollutants associated with the vessels will be released into the water column causing short term negative effects. Depending on the chemicals present this could represent a significant negative impact. **Mitigation**; Measures will be taken to investigate vessels prior to removal to ascertain the nature of any possible pollutants, steps will then be taken to minimise risk of releasing pollutants into the environment. Where possible a physical barrier will be erected to contain contaminants and allow their safe disposal **Residual impact**; As a short-term temporary impact on the status of physio-chemical quality elements, the	Biological element 'fish' is currently reported as 'Good', however, in the absence of mitigation it is likely that during removal of sunken vessels oil, diesel or other pollutants associated with the vessels will be released into the water column causing short term negative effects on fish. Depending on the chemicals present this could represent a significant negative impact. **Mitigation**; Measures will be taken to investigate vessels prior to removal to ascertain the nature of any possible pollutants, steps will then be taken to minimise risk of releasing pollutants into the environment. Where possible a physical barrier will be erected to contain contaminants and allow their safe disposal. **Residual impact**; As a short-term temporary impact on the status of this biological element, the residual impact	Biological element 'invertebrates' is currently reported as 'Moderate', however, in the absence of mitigation it is likely that during removal of sunken vessels oil, diesel or other pollutants associated with the vessels will be released into the water column causing short term negative effects on fish. Depending on the chemicals present this could represent a significant negative impact. **Mitigation**; Measures will be taken to investigate vessels prior to removal to ascertain the nature of any possible pollutants, steps will then be taken to minimise risk of releasing pollutants into the environment. Where possible a physical barrier will be erected to contain contaminants and allow their safe disposal. **Residual impact**; As a short-term temporary impact on the status of this

Scheme Component	Biological and Physio-chemical Elements		
	Physio-chemical Elements	**Fish**	**Invertebrates**
	residual impact on the ability of the waterbody to meet WFD objectives (Good Ecological Potential by 2027) is considered negligible.	on the ability of the waterbody to meet WFD objectives (Good Ecological Potential by 2027) is considered negligible.	biological element, the residual impact on the ability of the waterbody to meet WFD objectives (Good Ecological Potential by 2027) is considered negligible.
Water Injection Dredging (WID)	Whilst WID usually ensures that sediment stays at the bottom of the river and the rest of the water column remains undisturbed, there is a risk that WID could increase sediment load throughout the water column and consequently increase levels of nitrates, phosphate, copper and zinc temporarily. **Mitigation**; Measures will be taken to minimise sediment disturbance, however, any pollutants which are intimately associated with sediment will be mobilised through this operation. **Residual impact**; As a short-term temporary impact on the status of physio-chemical quality elements, the residual impact on the ability of the	Whilst WID usually ensures that sediment stays at the bottom of the river and the rest of the water column remains undisturbed, there is a risk that WID could increase sediment load throughout the water column and consequently increase levels of pollutants temporarily negatively impacting on fish. **Mitigation**; Measures will be taken to minimise sediment disturbance, however, any pollutants which are intimately associated with sediment will be mobilised through this operation. **Residual impact**; As a short-term temporary impact on the status of this biological element, the residual impact on the ability of the waterbody to meet	Whilst WID usually ensures that sediment stays at the bottom of the river and the rest of the water column remains undisturbed, there is a risk that WID could increase sediment load throughout the water column and consequently increase levels of pollutants temporarily negatively impacting on invertebrates. **Mitigation**; Measures will be taken to minimise sediment disturbance, however, any pollutants which are intimately associated with sediment will be mobilised through this operation. **Residual impact**; As a short-term temporary impact on the status of this biological element, the residual impact on the ability of the waterbody to meet

Scheme Component	Biological and Physio-chemical Elements		
	Physio-chemical Elements	**Fish**	**Invertebrates**
	waterbody to meet WFD objectives (Good Ecological Potential by 2027) is considered negligible.	WFD objectives (Good Ecological Potential by 2027) is considered negligible.	WFD objectives (Good Ecological Potential by 2027) is considered negligible.

Assessment of Option B Hull Tidal Barrier against biological quality elements of River Hull from Arram Beck to Humber

Scheme Component	Biological Quality Element
	Fish
Optimisation of barrier closure to reduce tidal propagation without detrimentally restricting river outflow.	Biological element 'fish' is currently reported as 'Good', however, there is a possibility that increased closure of a tidal barrier will restrict fish movements between the River Hull and Humber Estuary for fish species including eels and sea lamprey. The risk of compromising fish movements is considered to be small as the river will continue to discharge into the Humber Estuary in the usual way for the majority of the time except on tides greater than 2m AOD. **Mitigation**; Fish presence both sides of the barrier will be monitored to ascertain if the increased closure has had a negative impact on fish movements. **Residual impact**; This represents a long term potential impact on the status of this biological element, the residual impact on the ability of the waterbody to meet WFD objectives (Good Ecological Potential by 2027) is considered highly unlikely but moderately severe if movement of fish stocks is shown to be deterred by the increased use of the tidal barrier.

Contributing to achievement of WFD objectives

In order to contribute to ensuring waterbodies meet their WFD objectives each waterbody has a list of mitigation measures which must be delivered in order to meet WFD targets for the overall status objective, the ecological status or potential objective and the chemical status objective. To ensure RHICS options comply with WFD objective 4, each option should be designed to contribute to targets listed in RBMP for each waterbody.

Table 8 Assessment of options against delivery of mitigation measures that have defined Ecological Potential

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
A	GB104026067210 River Hull from Arram Beck to Humber	Educate landowners on sensitive management practices (urbanisation)	No	
		Sediment management strategies	Yes	There is evidence that riparian reedbeds have encroached by up to 4m since a detailed survey in 1992 reducing the width of the river channel and encouraging sedimentation. This process has been promoted by a decline in river traffic which helped to keep the watercourse maintained through incidental dredging caused by turbulence from propellers. Water injection dredging mobilises sediment in a similar way to river traffic. Dredging and removal of riparian vegetation is proposed for this watercourse from Humber to Ennerdale Bridge only. Removal of reedbed will be off-set by reedbed creation where foreshore allows (the space between river channel and embankments). Sediment transport will be enhanced by implementation of Option A.
		Structures or other mechanisms	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		in place and managed to enable fish to access waters upstream and downstream of the impounding works.		
		Improve floodplain connectivity	No	
		Set-back embankments	No	
A	Groundwater body G41 - GB40401G700 700 Hull and East Yorkshire Chalk	RHICS must not compromise efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be avoided whilst making efforts to support re-charging of the groundwater body.	Yes	This option will not compromise such efforts.
A	GB5304026092 01 T1 Humber Lower	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		replacement with soft engineering		
A	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
B	GB104026067210 River Hull from Arram Beck to Humber	Educate landowners on sensitive management practices (urbanisation)	No	
		Sediment management strategies	Yes	The barrier will be replaced with mitre gates and will be activated more often (on a 2m tide rather than on 4.25m tide as present). Sediment in the tidal River Hull is largely derived from the Humber Estuary carried on water entering during high tide. Restriction of tidal movement upstream will serve to reduce sedimentation in the watercourse.
		Structures or other mechanisms in place and managed to enable	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		fish to access waters upstream and downstream of the impounding works.		
		Improve floodplain connectivity	No	
		Set-back embankments	No	
B	Groundwater body G41 - GB40401G700 700 Hull and East Yorkshire Chalk	RHICS must not compromise efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be avoided whilst making efforts to support re-charging of the groundwater body.	Yes	The measure will not compromise these efforts. More effective and increased use of the barrier will reduce the brackish-ness of R Hull in its tidal section. It has been speculated that this may reduce saline intrusion into groundwater resource.
B	GB5304026092 01 T1 Humber Lower	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		engineering		
B	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
C	GB104026066950 Holderness Drain Source to Fordyke Stream	Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system.
C	GB104026066800 Holderness Drain from Fordyke Stream to Humber	Educate landowners on sensitive management practices (urbanisation)	Yes	As part of a wider RBMP programme.
		Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
C	Groundwater	RHICS must not compromise	Yes	This option will not compromise such efforts.

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	body G41 - GB40401G700 700 Hull and East Yorkshire Chalk	efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be avoided whilst making efforts to support re-charging of the groundwater body.		
C	GB530402609201 T1 Humber Lower	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
C	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		defence		
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
D	GB104026066800 Holderness Drain from Fordyke Stream to Humber	Educate landowners on sensitive management practices (urbanisation)	No	
		Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
D	Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	RHICS must not compromise efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be avoided whilst making efforts to support re-charging of the groundwater body.	Yes	This option will not compromise such efforts.
D	GB530402609201 T1 Humber	Preserve and enhance ecological value of marginal	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	Lower	aquatic habitat, banks and riparian zone		
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
D	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
E	GB104026067000 River Hull from West Beck to Arram	Provide flows to move sediment downstream.	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	Beck	Maintain sediment management regime to avoid degradation of the natural habitat characteristics of the downstream river.	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Improve floodplain connectivity	No	
		Set-back embankments	No	
		Alteration of channel bed (within culvert)	No	
		Re-opening existing culverts	No	
E	GB104026066870 Arram Beck 1	Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Improve floodplain connectivity	No	
		Set-back embankments	No	
E	GB104026067210 River Hull	Educate landowners on sensitive management practices	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	from Arram Beck to Humber	(urbanisation)		
		Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Improve floodplain connectivity	No	
		Set-back embankments	No	
E	Groundwater body G41 - GB40401G700 700 Hull and East Yorkshire Chalk	RHICS must not compromise efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be avoided whilst making efforts to support re-charging of the groundwater body.	Yes	This option will not compromise such efforts.
E	GB5304026092 01 T1 Humber Lower	Preserve and enhance ecological value of marginal aquatic habitat, banks and	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		riparian zone		
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
E	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
F	GB104026067000 River Hull from West Beck to Arram Beck	Provide flows to move sediment downstream.	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Maintain sediment	Yes	Increased flow rates will increase the amount of sediment moving down the

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		management regime to avoid degradation of the natural habitat characteristics of the downstream river.		system and reduce sedimentation.
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Improve floodplain connectivity	No	
		Set-back embankments	No	
		Alteration of channel bed (within culvert)	No	
		Re-opening existing culverts	No	
F	GB104026066870 Arram Beck 1	Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Improve floodplain connectivity	No	
		Set-back embankments	No	
F	GB104026067210 River Hull	Educate landowners on sensitive management practices	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	from Arram Beck to Humber	(urbanisation)		
		Sediment management strategies	Yes	Increased flow rates will increase the amount of sediment moving down the system and reduce sedimentation.
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Improve floodplain connectivity	No	
		Set-back embankments	No	
F	Groundwater body G41 - GB40401G700 700 Hull and East Yorkshire Chalk	RHICS must not compromise efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be avoided whilst making efforts to support re-charging of the groundwater body.	Yes	This option will not compromise such efforts.
F	GB5304026092 01 T1 Humber Lower	Preserve and enhance ecological value of marginal aquatic habitat, banks and	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		riparian zone		
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
F	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
G	GB104026067130 Garton Wold / Water Forlorns	Educate landowners on sensitive management practices (urbanisation)	Yes	A raft of strategies to slow flow off the land and ameliorate peak flows will be enacted using Countryside Stewardship and other grants directed at landowners.
		Sediment management strategies	Yes	Strategies to reduce the amount of sediment entering the watercourse will be enacted using Countryside Stewardship and other grants directed at landowners.

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
G	GB104026067060 Driffield Trout Stream	None listed.		NA
G	GB104026067080 West Beck Upper	Educate landowners on sensitive management practices (urbanisation)	Yes	A raft of strategies to slow flow off the land and ameliorate peak flows will be enacted using Countryside Stewardship and other grants directed at landowners.
		Operational and structural changes to locks, sluices, weirs etc	No	
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Remove obsolete structure	No	
G	GB104026067040 West Beck Lower to River Hull	Sediment management strategies	Yes	Strategies to reduce the amount of sediment entering the watercourse will be enacted using Countryside Stewardship and other grants directed at landowners.
		Improve floodplain connectivity	Yes	Wet woodland, riparian vegetation and flood-plain grazing marsh will be created using Countryside Stewardship and other grants directed at landowners.
		Set-back embankments	No	
G	GB104026067	Provide flows to move sediment	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	00 River Hull from West Beck to Arram Beck	downstream.		
		Sediment management strategies	Yes	Strategies to reduce the amount of sediment entering the watercourse will be enacted using Countryside Stewardship and other grants directed at landowners.
		Maintain sediment management regime to avoid degradation of the natural habitat characteristics of the downstream river.	Yes	Strategies to reduce the amount of sediment entering the watercourse will be enacted using Countryside Stewardship and other grants directed at landowners.
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Improve floodplain connectivity	Yes	Wet woodland, riparian vegetation and flood-plain grazing marsh will be created using Countryside Stewardship and other grants directed at landowners.
		Set-back embankments	No	
		Alteration of channel bed (within culvert)	No	
		Re-opening existing culverts	No	
G	GB104026066870 Arram Beck	Sediment management strategies	Yes	Strategies to reduce the amount of sediment entering the watercourse will be enacted using Countryside Stewardship and other grants directed at landowners.

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
	1	Improve floodplain connectivity	No	
		Set-back embankments	No	
G	GB104026067210 River Hull from Arram Beck to Humber	Educate landowners on sensitive management practices (urbanisation)	No	
		Sediment management strategies	Yes	Strategies to reduce the amount of sediment entering the watercourse upstream will be enacted using Countryside Stewardship and other grants directed at landowners.
		Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works.	No	
		Improve floodplain connectivity	No	
		Set-back embankments	No	
G	Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	RHICS must not compromise efforts to achieve Good Ecological Status by 2027, and increased levels of nitrates entering groundwater must be	Yes	This option will not compromise such efforts.

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		avoided whilst making efforts to support re-charging of the groundwater body.		
G	GB530402609201 T1 Humber Lower	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft engineering	No	
G	GB530402609202 T2 Humber Middle	Preserve and enhance ecological value of marginal aquatic habitat, banks and riparian zone	No	
		Managed realignment of flood defence	No	
		Removal of hard bank reinforcement / revetment or replacement with soft	No	

Option	WFD Receptor	Mitigation measure (only those not already in place are listed).	Delivery through this option?	Notes
		engineering		

DISCUSSION AND CONCLUSION

Water Framework Directive (WFD) Assessment examines the potential effects of the proposed scheme on the ecological quality of receptor WFD waterbodies. Effects which are likely to reduce the possibility of meeting WFD objectives or otherwise cause deterioration in the status of downstream and groundwater waterbodies are identified and assessed. The table below summarises our assessment of the options against WFD objectives for each effected waterbody.

If it is considered likely that significant effects due to the options discussed in this document will occur in Humber Estuary Special Area of Conservation (SAC) or Humber Estuary Special Protection Area (SPA), then options will need to be screened to assess whether Appropriate Assessment is necessary (Habitats Regulations Assessment).

Each option is assessed against predicted effects on WFD receptors and, taking into account mitigation, the residual effect on quality elements for each waterbody has been assessed. Using the results of this assessment it is possible to determine whether the options comply with the overarching objectives of the WFD for each waterbody as set out below;

- Objective 1: The proposed scheme does not cause deterioration in the WFD Status of the Biological, Chemical and other assessed Elements of the waterbody;
- Objective 2: The proposed scheme does not compromise the ability of the waterbody to achieve its WFD status objectives;
- Objective 3: The proposed scheme does not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD; and
- Objective 4: The proposed scheme contributes to the delivery of the WFD objectives.

Table 9 Assessment of Waterbodies against WFD Objectives;

Waterbody	**Complies with Objective 1**	**Complies with Objective 2**	**Complies with Objective 3**	**Compliance with Objective 4**
GB104026066950 Holderness Drain Source to Fordyke Stream	Yes	Yes	Yes	Sediment management strategies.
GB104026066800 Holderness Drain from Fordyke Stream to Humber	Yes	Yes	Yes	Educate landowners on sensitive management practices. Sediment management strategies.
GB104026067130 Garton Wold / Water Forlorns	Yes	Yes	Yes	Educate landowners on sensitive management practices. Sediment management strategies.
GB104026067060	Yes	Yes	Yes	None listed – NA

Waterbody	Complies with Objective 1	Complies with Objective 2	Complies with Objective 3	Compliance with Objective 4
Driffield Trout Stream				
GB104026067080 West Beck Upper	Yes	Yes	Yes	Educate landowners on sensitive management practices.
GB104026067040 West Beck Lower to River Hull	Yes	Yes	Yes	Educate landowners on sensitive management practices. Sediment management strategies.
GB104026067000 River Hull from West Beck to Arram Beck	Yes	Yes	Yes	Provide flows to move sediment downstream. Sediment management strategies. Maintain sediment management regime to avoid degradation of the natural habitat characteristics of the downstream river.
GB104026066870 Arram Beck 1	Yes	Yes	Yes	Sediment management strategies.
GB104026067210 River Hull from Arram Beck to Humber	Yes	Yes	Yes	Sediment management strategies.
Groundwater body G41 - GB40401G700700 Hull and East Yorkshire Chalk	Yes	Yes	Yes	RHICS does not compromise efforts to achieve Good Ecological Status by 2027.
GB530402609201 T1 Humber Lower	Yes	Yes	Yes	RHICS does not compromise efforts to achieve Good Ecological Status by 2027.
GB530402609202 T2 Humber Middle	Yes	Yes	Yes	RHICS does not compromise efforts to achieve Good Ecological Status by 2027.