

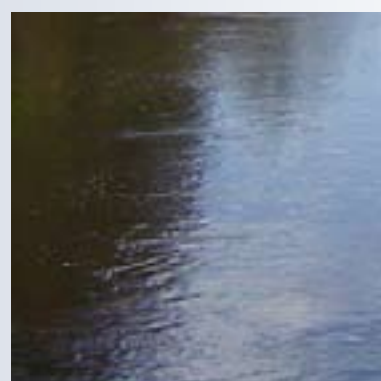
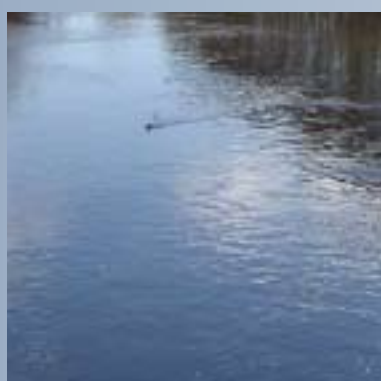
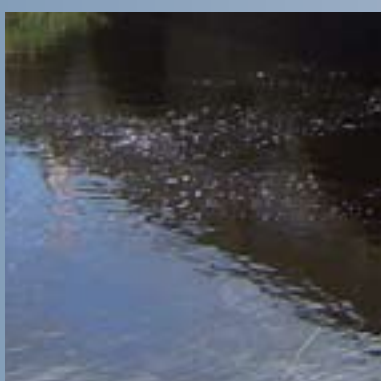
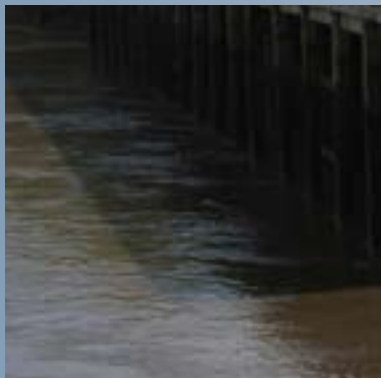
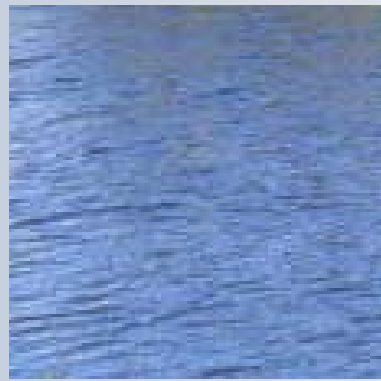
The background features a large, stylized number '1' in a dark blue color. The '1' is composed of a thick vertical stroke and a horizontal top bar. The top-left corner of the horizontal bar is rounded. The background is a gradient of blue, transitioning from a darker shade on the left to a lighter shade on the right.

Water

The first of the three topic masterplans relates to Selby District's most plentiful resource – water. The central part of the district lies in the flood plain of four major rivers and was so boggy that it was avoided by early settlers. While the area has been drained to become rich farmland, flooding is an ever-present issue. Selby experienced major floods in 1794, 1866, 1947, 1982 and most recently in 2000 while Tadcaster suffered in 1935 and 2000. Flood defences have been put in place and the Environment Agency has plans for further defences in the two towns. However, the agency is also exploring a wider strategy to manage the whole watershed to reduce the likelihood of flooding.

The water masterplan has looked at flood protection and how defences can be made effective without being intrusive. However, it has also looked at a wider strategy that works with the Environment Agency across the watershed to make water into an asset as much as a threat. Central to this strategy is the concept of a Yorkshire Water Park acting in the capacity of holding flood waters but also predominantly being a wildlife reserve and a visitor attraction.

Water



water

Water moulded the landscape of Selby District from the time when it was part of an inland sea estuary. This was later enclosed to become the glacial Lake Humber which, as it silted-up, became a huge marshy expanse of land avoided by early settlers. This has been gradually drained and turned over to agricultural land crossed by the meandering courses of the Rivers Ouse, Wharfe, Aire and the Derwent. Most of the district lies within the flood plain of these rivers and is not much more than 6m above sea level. This history of water has fundamentally influenced the landscape character of the district, which includes the following character areas:

Magnesian limestone ridge: The oldest physical influences are associated with the Magnesian limestone ridge, which runs along the western boundary of the district. Tadcaster and Sherburn-in-Elmet are both positioned on this ridge and are strongly

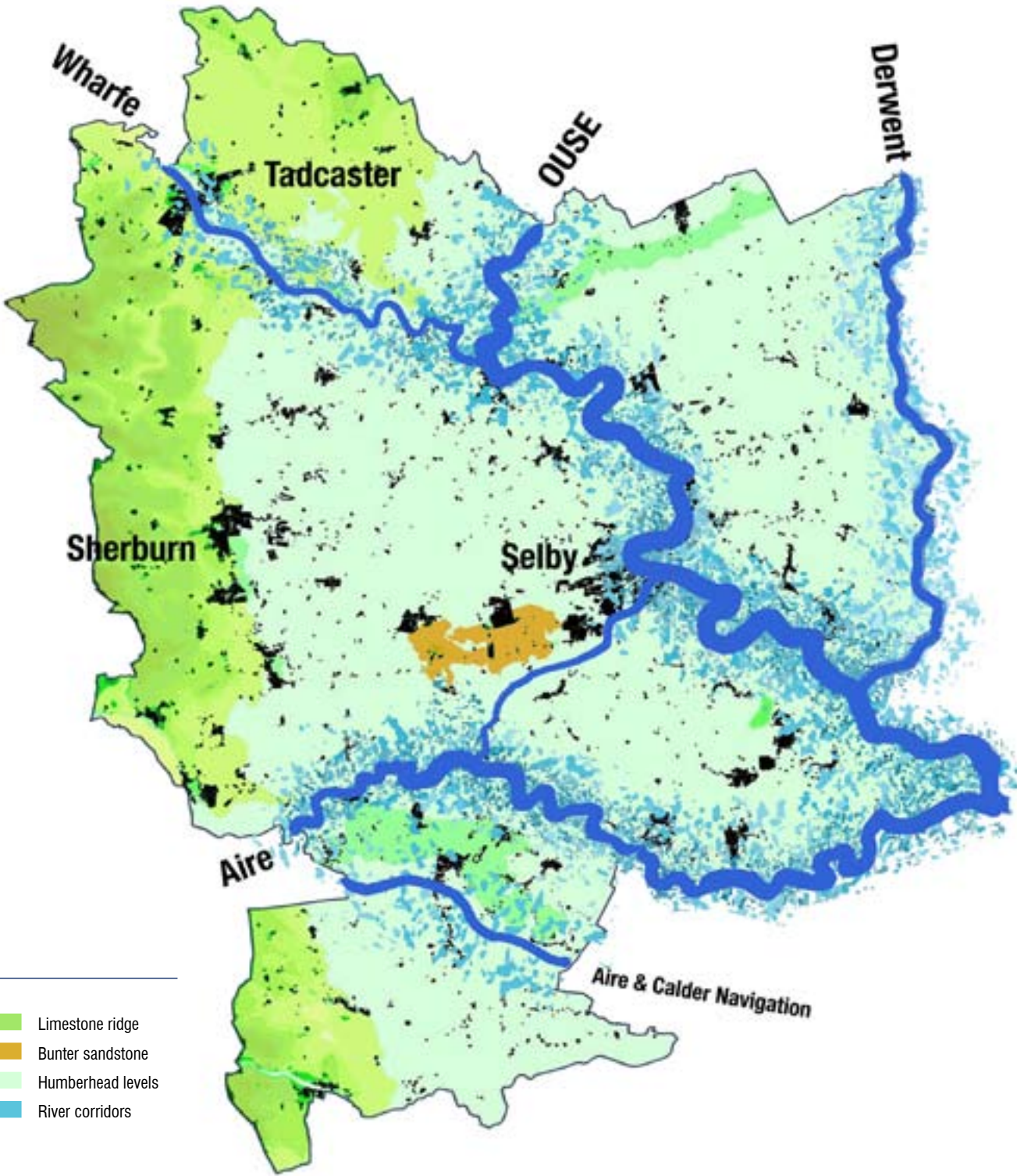
A district shaped by water





influenced by its specific qualities. The ridge was deposited in an enclosed evaporated inland sea during the Permian period, some 245 – 255 million years ago. The limestone has weathered to form a rounded rolling ridge with well-drained calcareous soils. The limestone is of considerable economic value and has been quarried since the middle ages for building stone, agricultural lime and latterly, crushed aggregate. Indeed the stone for York Minster was quarried in Tadcaster whose original name – Calcaria – means ‘place of limestone’.

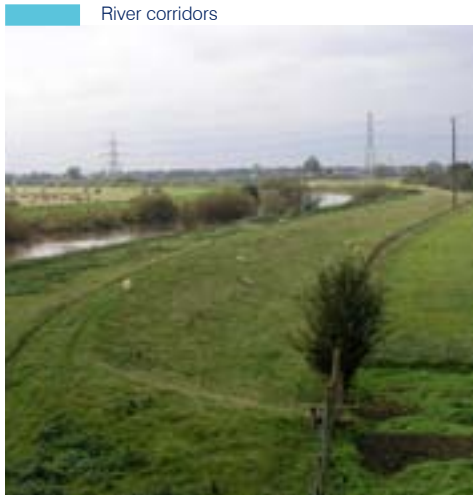
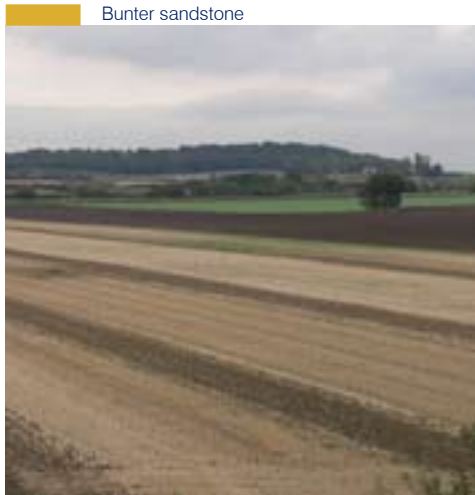
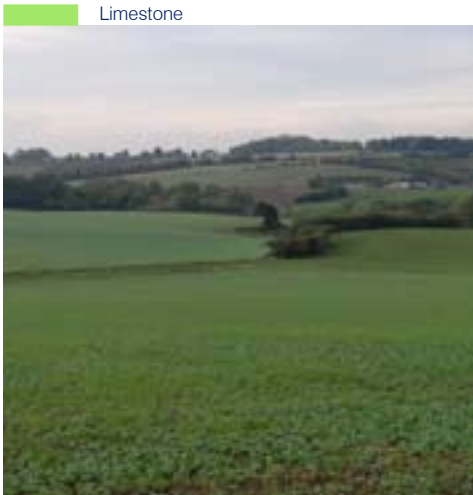
Bunter Sandstone: To the east of the ridge, the Limestone dips under the younger deposits of Bunter or Lower Red Sandstone of the Triassic period. This sandstone has been almost entirely masked by thick silt and clay deposits (see Humberhead levels). Outcrops are limited to the area around Hambleton and Thorpe Willoughby and around Carlton and Camblesforth to the south of the district.

Humberhead Levels: The distinctive, extremely low lying and exceptionally flat landform of the Humberhead Levels was created by alluvial deposits of silt and clay that settled out from the waters of the great ‘Lake Humber’, which was impounded by a glacier at the mouth of the Humber during the late Quaternary era. These deep deposits have formed some of the most productive agricultural areas of Britain. Selby, the principal town of the area, is positioned at its centre.

River corridors: The extensive network of broad, tidal and navigable rivers that drain the district has had an important influence on the landscape of the region. The Ouse is the principal river, supported by its tributaries, the Wharfe, Derwent and Aire. Alluvium deposits line the floors of the river channels, which are now generally confined within engineered embankments to control the flow of water through the district.



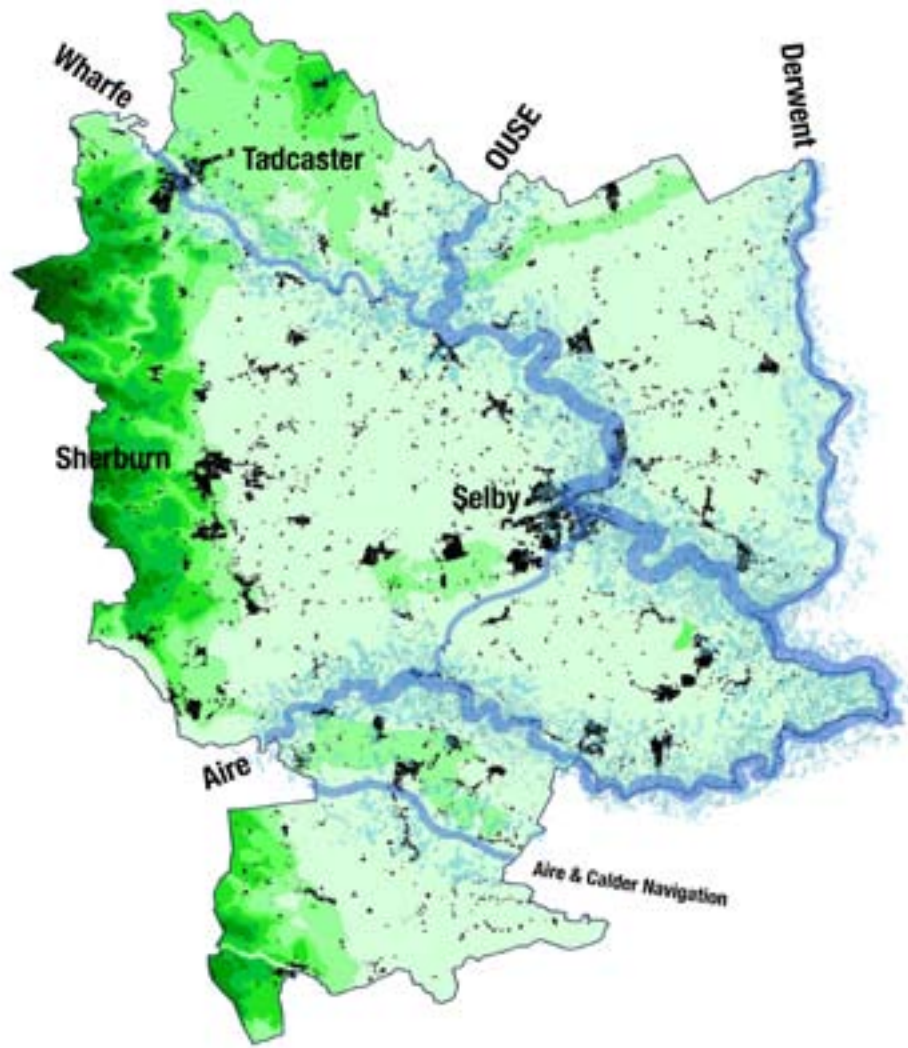
Key	
	Limestone ridge
	Bunter sandstone
	Humberhead levels
	River corridors



The background is a photograph of a field of tall, green grass, possibly reeds or marsh grass, with a blue overlay. A large, stylized number '2' is positioned on the left side of the image, partially overlapping the text 'water'.

water 2

Human
influences



Selby wharf



Tadcaster brewery



Woodlands



Intensive agriculture



Following the retreat of the last ice age 10,000 years ago, the flat Humberhead Plain was initially colonised by a large forest. 7,000 years later, rising sea levels pushed the Humber Estuary further inland and waterlogged the afforested areas, which were replaced by extensive areas of reed swamp.

The influence of humans started to be seen in the 11th century about the time of the foundation of Selby Abbey. Drainage and clearance of the swamps created broad areas of fertile farmland. Winter flooding deposited silts over the low-lying plain and rich wet grasslands developed. Traditionally the fertility of the wetland meadows was maintained by the technique of 'warping': the deliberate and managed flooding of meadows with fertile silt laden waters. The resulting layers of silt, not only increased fertility, but

also, gradually led to an increase in ground levels. The seasonal flooding also flushed surface salts out of the soil to ensure its continued health.

This rich farmland is one of the most productive areas of Britain and has led to large-scale farm intensification in some areas. This has led to habitat impoverishment particularly of wetland habitats, loss of trees and hedgerows and the localised lowering of the water table through water abstraction. The recently introduced Single Farm Payment and Stewardship schemes may lead to diversification of agricultural practices, with more emphasis being placed on conservation issues and alternative uses of the land.

Remnants of the more natural vegetation cover within the region are commonly associated with the river corridors and are recognised and protected as sites of environ-

mental interest (including eight SSSI's in the district). Water vole, otters and bats are present within the area and the only confirmed British population of the rare Tansy beetle is situated within the district. The visual amenity of the river corridors is an important local resource and is recognised by a number of designated Special Landscape Areas.

Human settlement

The agrarian-based settlement pattern of the district comprises a large number of evenly distributed rural villages and hamlets supported by the larger market towns of Selby and Tadcaster. Once again water has had a large part to play in the evolution of the larger settlements offering key crossing points or providing the opportunity for water borne transport.

Selby is positioned at the highest

point on the river Ouse navigable by sea-going vessels and was originally developed as an important medieval inland port. Tadcaster was positioned on the Great North Road (Roman) at an important crossing point of the River Wharfe.

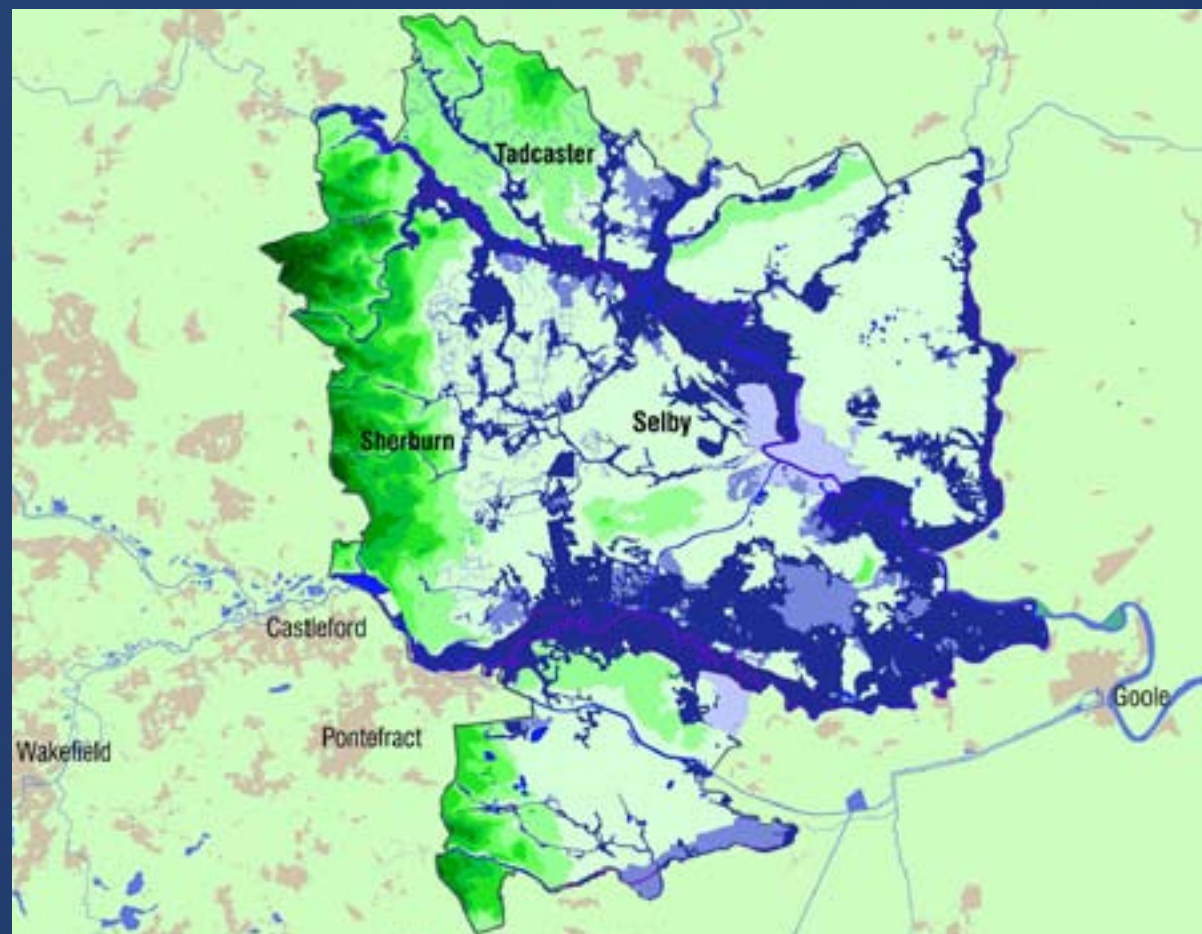
Water has also shaped the economy of the district from the port and shipbuilding industries of Selby to brewing in Tadcaster. The latter is based on the special qualities of the local water filtered through limestone and gypsum rendering it ideal for brewing.

The rivers have therefore always been seen as both a threat and opportunity. The dangers of flooding have been balanced against a desire to live and work near water and the resultant pressure to develop within the natural flood plain.

water 3

Key

- 100 year flood level
- 200 year flood level
- Areas benefiting from flood defences
- Water bodies



The
threat

Temporary flood defences in Selby



The 1947 flood in Selby and the 1935 flood in Tadcaster



Selby's flood defences in the 2000 flood



Flood defence banks in Tadcaster and Selby



Selby has experienced five major floods in just over 200 years, Tadcaster two major floods within the last 70 years. This is a result of its low-lying flat landscape crossed by tidal rivers. Flooding has generally occurred when severe rainfall in the watershed combines with a high tide. Over the years flood defences have reduced the impact of flooding and if the situation were stable, the works planned over the next five years by the Environment Agency would largely solve the issue.

However, the situation is unfortunately not stable. Information from the study 'Warming up the Region' (UK Climates Impact Programme) documents how climate change has already affected the region:

- Over the last 120 years there has been a temperature rise of 0.5°C

most of which has happened since 1990.

- While regional rainfall is not increasing more of the rain falls in winter. Winters have become 30% wetter while we have had 60% less rainfall in summer. This increases the prospects of summer droughts and winter floods.
- Average tide levels on the east coast have risen at rates between 1.5 and 3.6mm per year over the last 80 years.

These trends are predicted to get worst as global warming becomes even more apparent. Annual temperatures are predicted to rise by between 1.6 and 3.9°C by 2080. This is likely to lead to a reduction of annual rainfall of between 10 – 20% but a sea-level rise of 15 – 75cm. This will

also mean that the growing season increases by 45 to 100 days a year.

Impact on the district

These changes to the region's climate will have significant impacts on many aspects of life within Selby and Tadcaster. These may include:

- Increased frequency and severity of flood events
- Higher tidal surges
- Increased influence of saline water
- Changes to the patterns of agricultural production
- Increased demand for water
- Changes to the quality and

volume of available water

- Changes to wildlife species and habitats

Despite an overall reduction in rainfall the district will become increasingly prone to winter flooding. There are currently 86km of flood defences on the River Ouse, of which 78km are flood embankments and 8km hard defences such as flood walls. Even with the works planned to extend these defences, the uncertainty that results from global warming means that they may not be enough.

Currently there are concerns that this could be further exacerbated by faster run-off from upland areas, an increasing volume and speed of run off from built-up areas and the loss of traditional flood plains to development. It is unlikely that flood defences can be made ever higher to

counter the threat of global warming and there is only so much that can be done at the district level to address the causes of global warming (see the Energy masterplan). The Water strategy therefore needs to reduce the volume and speed of run-off from uplands and built-up areas and increase the capacity of the river system to accommodate flood water. These issues are dealt with on the following pages.

water4



Waterside development in Ecolonia Holland



Emscher Park Germany



Earthcentre, Doncaster



The
concept



There is a growing recognition of the threat posed by increased flood risk. This threat needs to be addressed. However, the concept of the SDF is to do this in such a way that a range of benefits are achieved that contribute to the economy, environment and quality of life of the district. Water can therefore become a force for renaissance.

Defence

This is in line with the 100-year strategy published by the Environment Agency for the Ouse. This is moving towards a more holistic and sustainable approach to managing the increase risk of flooding nationally and regionally. The strategy promotes a more natural management of the water within the overall catchment of the river including a range of interventions in two broad categories: reducing the speed of

water run-off and addressing flood defences in and around settlements as dealt with in Section 6.

Added benefits

While the Environment Agency's primary concern is managing the flow of water through the region, these measures potentially have a series of benefits that could contribute significantly to the renaissance of Selby. These may include:

- Waterside development (as proposed in the Selby and Tadcaster Plans)
- Leisure and recreation facilities (as proposed in the Yorkshire Water Park in section 7)
- Agricultural diversification
- Biomass crop production

(as proposed in the Energy masterplan in Section 2)

- Wetland habitat restoration
- Hydroelectric power
- Storage of water

The water masterplan is therefore based on a series of measures to reduce the risk of flooding both within the catchment area and within the heart of each of the towns. The latter are incorporated into the town masterplans as part of environmental works and waterside housing development so that the flood defences can be used to enhance the waterside environment and bring it back into productive use.

The main project is the Yorkshire Water Park on land near Selby town (Section 7). This will involve the creation of a series of linked

water bodies, both permanent lakes and seasonal features. It will hold flood water to reduce flooding in Selby while providing a distinctive landmark development. It presents a unique opportunity to raise the profile of Selby as a prime example of sustainable development improving the quality of life for local residents, bringing new economic benefits to the area, enhancing and supporting local wildlife and improving water management for the region.

The other major project is a long-term proposition and relates to controlling the tidal nature of the river system (Section 8). This would have significant benefits in making the river more navigable for leisure uses and remove the threat of tidal flooding. It does, however, raise a range of wider issues that would need to be subject to separate study.



water 5

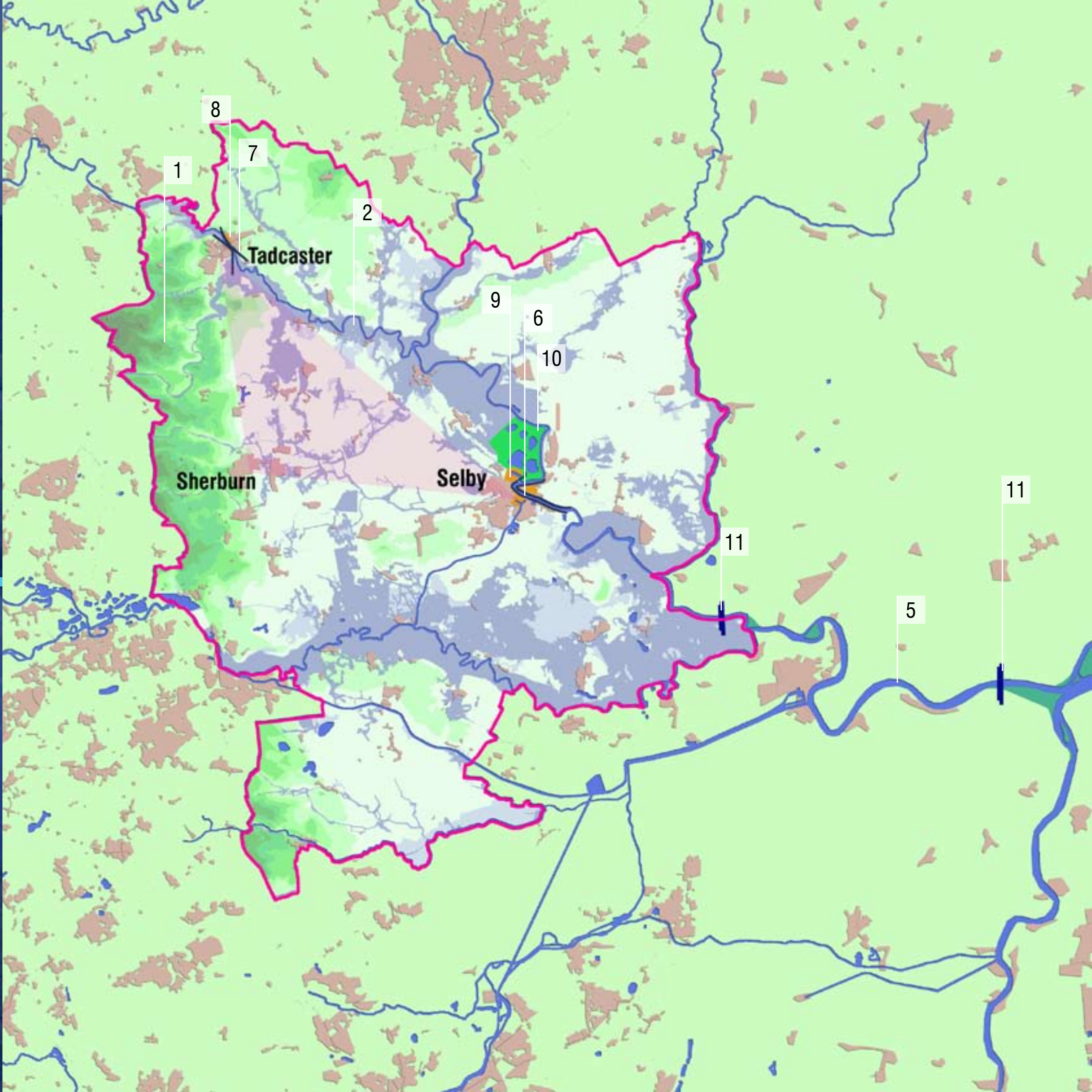
Flood prevention:

1. Afforestation of the upper reaches of the catchment area.
2. Holding areas for water along the principal rivers.
3. No new development in the flood plain unless within the area protected by flood defence in the two towns.
4. All new development proposed in the town masterplans to incorporate Sustainable Urban Drainage systems and to be designed with permeable surfacing to reduce run-off.
5. Repositioning of tidal defences further inland.

Water Renaissance

6. Riverside Park in Selby incorporating the flood defences.
7. Riverside environmental improvements to the valley in Tadcaster to incorporate the flood defences and create a circular walk.
8. Waterfront housing development in Selby and Tadcaster incorporating flood defences.
9. The development of a Selby marina either as an extension of Holme Lane or as part of the Station Quarter.
10. The development of a regional water park incorporating holding capacity for flood water as well as being a regional tourist attraction and wildlife resource.
11. Potential future tidal barrage/weir.

The masterplan



Sherburn

Tadcaster

Selby

1

8

7

2

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6

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11

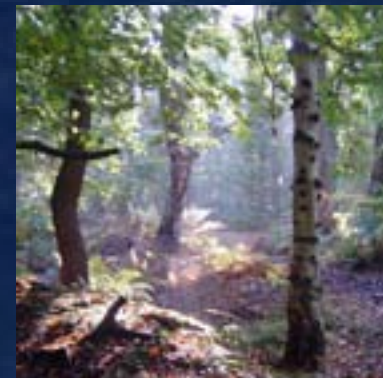
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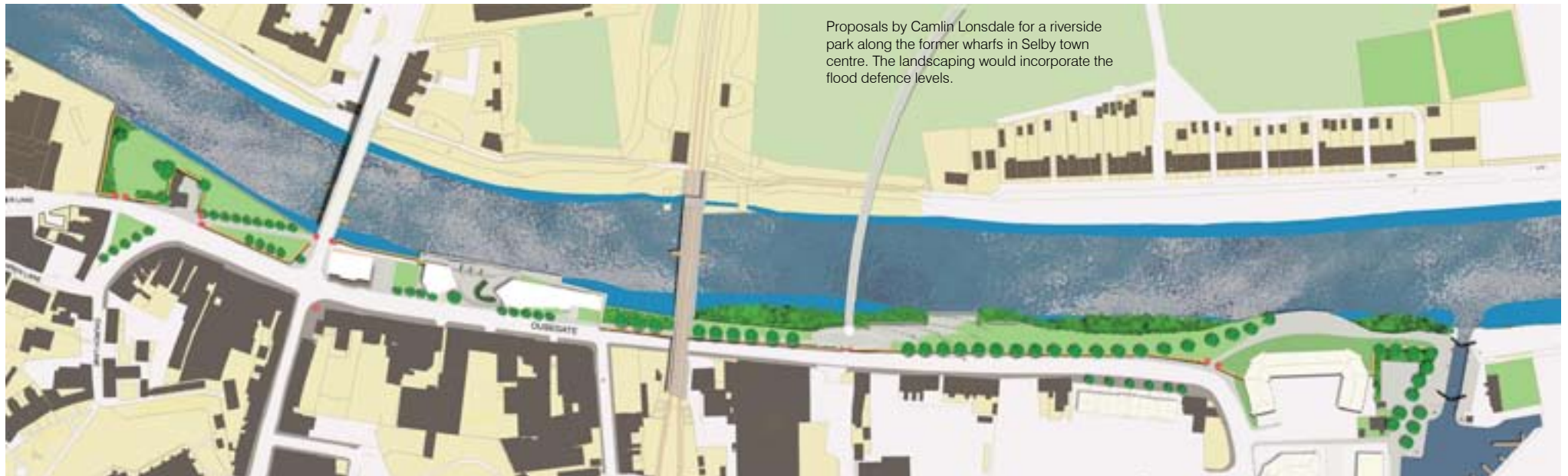
water6



An illustration by Camlin Lonsdale to show how the appartments proposed on Selby waterfront could create a public square incorporating flood defences.



Flood defence



Measures to reduce flooding are the responsibility of the Environment Agency and it is not the role of the SDF to go too deeply into the Environment Agency area of responsibility. The EA approach to flooding in Selby District is contained within their 100 year Flood Risk Management Strategy covering the Ouse. The areas of overlap with the SDF include:

Tree planting: The reforestation of the upper reaches of the catchment area helps to slow run-off. Much of this will take place outside the district. There are, however, opportunities, with farm set-aside, to increase the amount of forestation in the district.

Water holding areas: New lakes along the waterways/rivers can play a valuable role in providing capacity

for flood waters as well as holding water for use by farmers during dry summer periods. The repositioning of flood defences further from the river can also create a greater holding capacity.

Restrictions on development: Given that much of the district lies within a flood plain it is clearly not possible to restrict this entirely. However, developments such as Olympia Park in Barby will need to ensure that flood defences are in place before new housing/business development is occupied.

Sustainable Drainage: All new developments proposed in the town masterplans should incorporate Sustainable Urban Drainage systems and be designed with permeable surfacing to reduce run-off.

River corridors within settlements

The overlap between flood defences and the Renaissance strategy are greater within Selby and Tadcaster. In both towns the danger of flooding has, to an extent, caused the towns to turn their back on their river. Elsewhere insensitive flood defences have exacerbated this by blocking views of the water. In developing the Water SDF we have been concerned that this does not happen in Selby District. The town masterplans have therefore addressed the issue of implementing the flood defences in a way that adds to the renaissance of the town. If this is achieved there is the potential to open up the towns again to their rivers, to create waterside public open space and to encourage waterside development. The proposals include:

- A waterfront park in Selby

(see section 6.7 of the Selby masterplan). This creates a landscaped area incorporating the flood defence levels as part of a linear park.

- Waterfront flats and a cafe proposed within the Selby waterfront park. The scheme incorporates an aquatic barrier with the first level of accommodation above this.
- In Tadcaster it is proposed that the flood defences along the valley be incorporated into a landscape scheme for the whole area incorporating a circular walk.
- Housing development on the PowerPlus / Mill Lane site is proposed to incorporate a flood defence barrier as per the waterfront park in Selby.



water

Yorkshire Water Park



The flagship proposal in the water masterplan is the Yorkshire Water Park. This is envisaged as a large area within the flood plain including a series of lakes and areas where planned flooding can take place. The water park is designed to provide capacity to hold flood water so reducing the impact of flooding along the river. However, it will also have a number of other benefits:

- An amenity, education and recreation resource including access to the countryside.
- A regional leisure facility providing active (water sports) and passive (walking) recreation for both local people and visitors.
- An important wetland wildlife habitat including wet woodland and meadows.
- A demonstrator area for biomass production and farm diversification.

- A demonstrator project for sustainable development in the region.

The proposal:

There are a number of precedents for this type of water park in the UK. The Wetlands and Wildfowl Trust have nine centres in the UK, the best known being Slimbridge wildlife sanctuary in Gloucestershire. The Cotswolds Water Park near Cirencester claims to be the largest water park in the UK and includes recreational facilities and wildlife in a series of former sand and gravel pits. Other examples include the Milton Keynes Parks Trust's Floodplain Forest and the Cuckmere estuary, which involves the recreation of tidal marshes.

The Yorkshire Water Park will involve elements of each of these. It will cover 900 ha of land including lakes, marshes and flood meadows.

We have explored a number of potential locations for the water

park. The suggested site is the Cawood/Wistow Ings to the north east of Selby town (although there are potential other sites to the north and south). This is a good location for flood alleviation and also has the advantage of being close to Selby so that it can benefit from the town's transport links and the benefits can contribute to Selby's economy. The water park will include:

- Active water sports – water skiing, boating, rowing and sail-boarding.
- Leisure facilities from organised active to informal passive enjoyment of the countryside.
- The creation of a series of habitat types including wetlands and areas for migratory and permanent wildfowl.
- Temporary water storage – in flood conditions as well as water storage for use in times of

regional shortage (Water towers could also be used as vantage points to gain elevated views across the flat landscape).

- Demonstrator areas for agricultural diversification, biomass production, renewable energy and potentially fisheries/aquaculture.
- A visitor centre providing facilities for recreation and an interpretation centre for wildlife, sustainable development and agricultural diversification.
- Marina development: There is the possibility, as illustrated below, of linking the water park to the Holme Lane Marina as described in Section 6.8 of the Selby masterplan. The marina would include residential development to integrate the water park with Selby town.



water

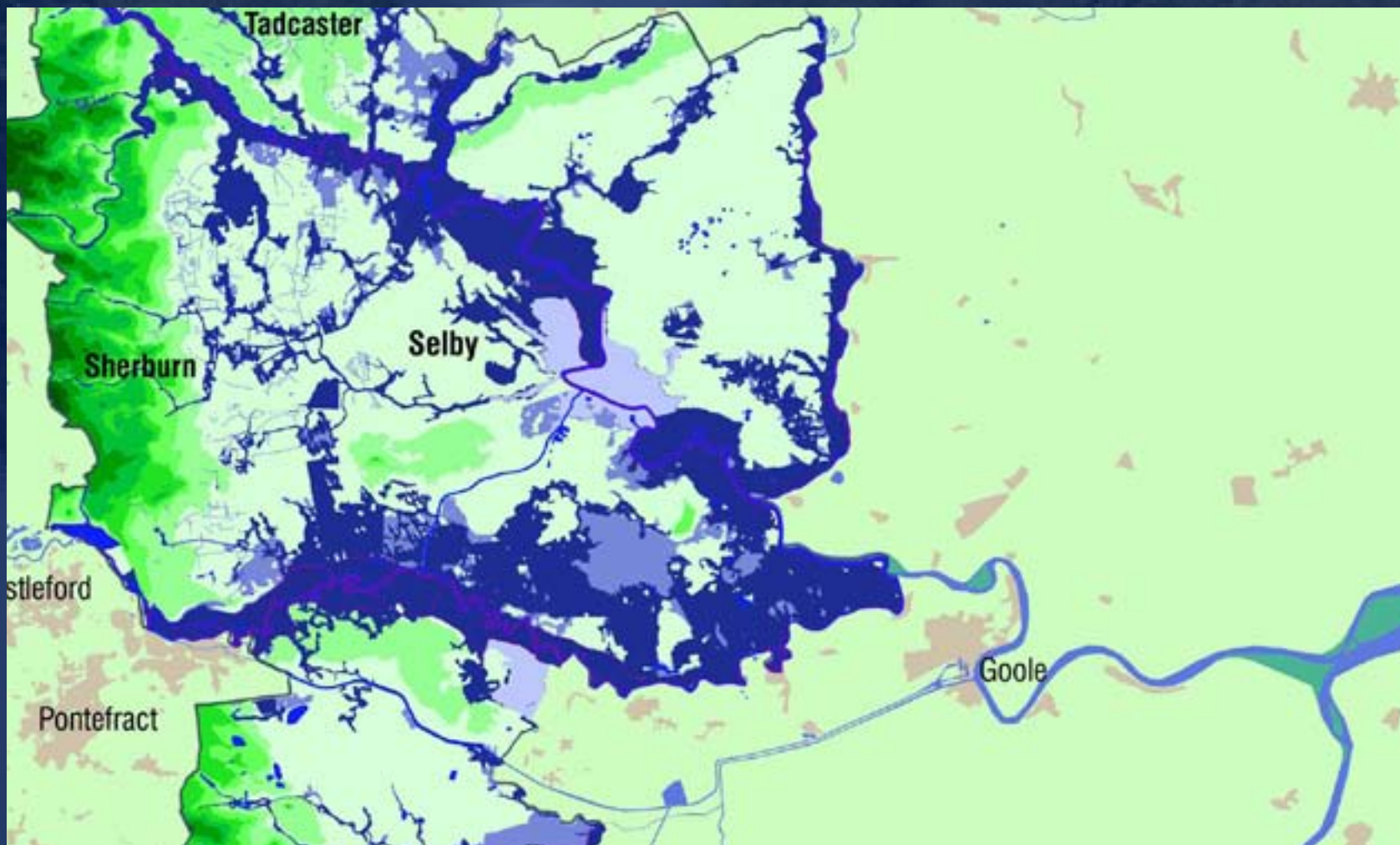


Yorkshire Water Park

Two illustrations of the Yorkshire Water Park. To the left the normal condition of the park, below, the situation during flood when the area would hold water to reduce downstream flooding.



water8



Tidal
barrage

The Cardiff Barrage was built across a harbour with a 14m tidal range- one of the greatest in the world. The barrage has eliminated the effect of the tide releasing the development potential of the waterfront. Completed in 1999, it has created a 500 acre freshwater lake with 8 miles of waterfront.



The Tees Barrage (three pictures below) which incorporates a road bridge retains a constant upstream water level. Near to Stockton town centre it incorporates a navigation lock, a fish path and canoe slalom course. Upstream it has led to 100ha of waterside development.



The Naburn Marina made possible by a tidal weir on the River Ouse north of Selby



The Dinard Barrage in France



The River Hull tidal barrage



Significant changes are being made in the management of coastal waters within the northeast region. Flood defences are being moved further inland and the sea encouraged to breach the existing coastal defences. This will create inter-tidal mud flats and creeks that absorb the energy of high tides and provide valuable habitats for wading birds. This in turn may reduce the risk from tidal floods higher up the water corridor.

Potential Barrage

As part of the SDF we have explored the possibility of further controlling the tidal flow of the river. At present the River Ouse, as it passes through Selby, is quite aggressively tidal. The currents in the river are very strong and mud flats are exposed at

low tide. This limits the potential for riverside development as well as the scope for leisure boating. Naburn, further north on the Ouse benefits from a tidal weir and lock, beyond which is a busy leisure marina supporting boat yards and leisure boating.

We have therefore explored the possibility of creating a barrage south of Selby on the River Ouse. The precedents for this include the barrages on the river Tees and River Hull as well as the Cardiff Barrage that made Cardiff bay none-tidal thereby promoting a huge regeneration of the area.

There are a number of benefits that this could bring. The main benefit would be flood management. By making the river system non-tidal, the barrage would prevent tidal inundation one of the major causes

of flooding. The other benefits would include the creation of a hugely increased length of navigable waterway. This in turn would allow Selby to develop a leisure boating and water sports industry. A marina could be developed on the Ouse and the new navigable rivers would allow all of the disconnected sections of leisure waterway in the region to be joined-up. It would help to transform the waterfront in Selby allowing the town to embrace the river with waterside development and housing.

The barrage could also be used to create new wetland habitats as well as being a source of hydroelectric power. However, the proposal is not without potential problems as the consultations as part of the SDF have highlighted. These mainly relate to the flow of silt in the river system that could harm important wildlife

habitats throughout the river system but particularly in the Humber Estuary. There is also a possibility of increasing contamination in the river system and increasing the risk of flooding elsewhere.

These issues will need to be studied in much more detail if the idea is to be progressed. However, the potential benefits to Selby District are great.