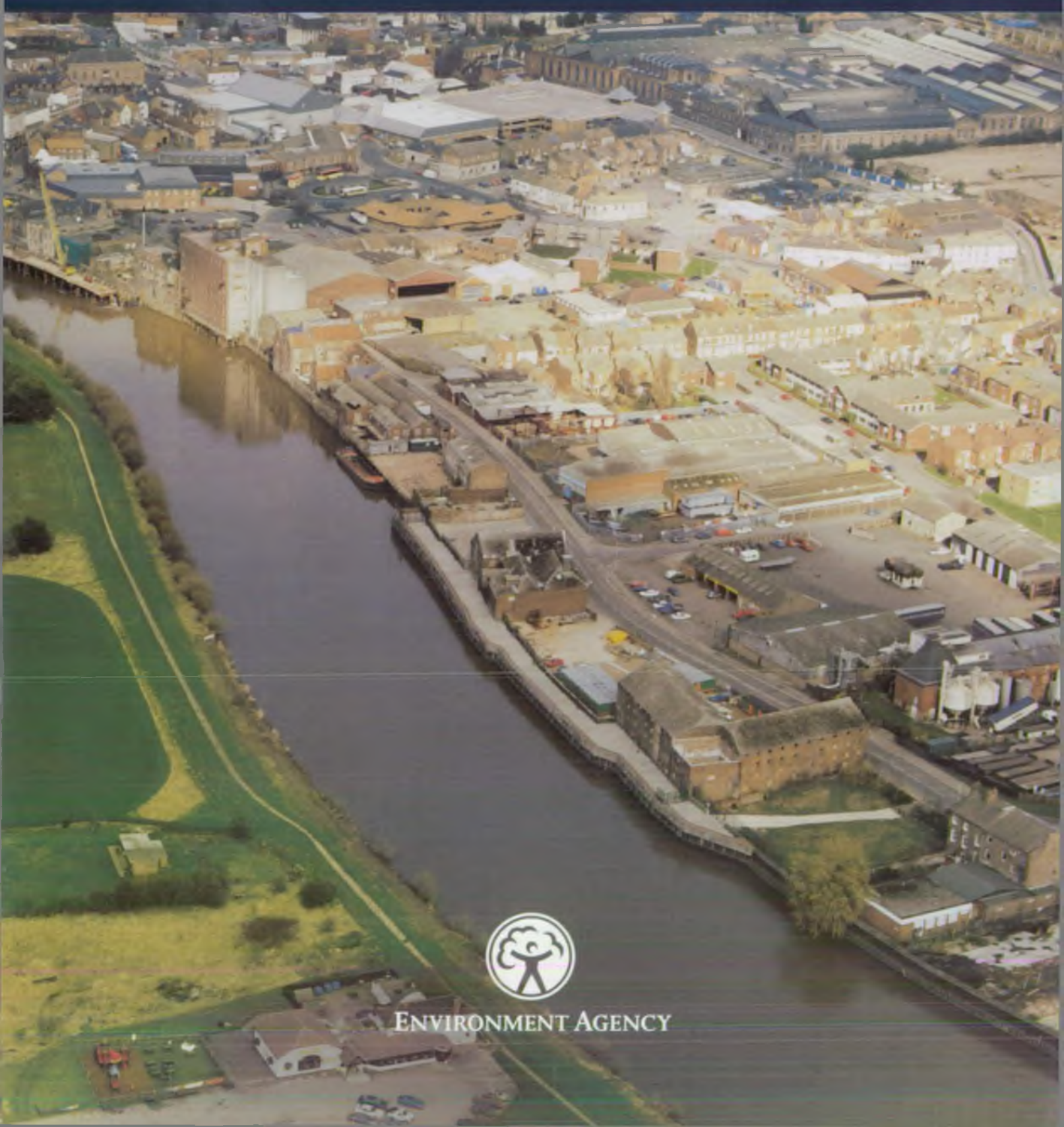


Gainsborough

flood alleviation scheme



ENVIRONMENT AGENCY

Gainsb

a catalyst for regeneration



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Foreword

by Dr David King, Midlands Regional Director, Environment Agency

I am delighted that this imaginative and innovative scheme has come to fruition. The work is an excellent example of partnership between the Environment Agency, Gainsborough Regeneration, West Lindsey District Council, Lincolnshire County Council and the Ministry of Agriculture, Fisheries and Food (MAFF).

The flood defence scheme has become the catalyst for the redevelopment of the waterfront, with the Agency working closely with other organisations to progress major renewal plans as part of the Gainsborough Riverside Regeneration Project.

The scheme will safeguard the town of Gainsborough against flooding from the River Trent and has provided a major improvement to the riverside of the town together with the new public facility of a riverside promenade. It is generally accepted that the riverside improvement and associated urban regeneration would not have occurred without the impetus given by the flood alleviation scheme. The scheme has had strong support from local people, businesses and agencies, where its importance to Gainsborough as a means of making a significant improvement to the overall image of the town, as well as to the riverside area itself, has been seen as crucial to the future prosperity of the community.



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*by Councillor Keith Whaley, Chairman,
Gainsborough Regeneration*

Many people will remember the disastrous floods of 1947, which covered a large part of the town and many more will have seen photographs and heard stories. The need to renew the flood defences and the advanced state of physical dereliction of the riverside area led to a combined vision of how these two problems could be addressed in a unified way. The resulting partnership between the Environment Agency and Gainsborough Regeneration has become an example of good practice, admired from around the country.

Only by working closely together in so many different ways has it been possible to realise the vision of a new aspect for the river frontage, new access areas, improved public amenity and new opportunities for development as well as long term security for the town's flood defences. With the recent completion of the final phase of flood defence works we can begin to see just how important the collaboration between the Environment Agency and Gainsborough Regeneration has been. The people of Gainsborough can not only sleep in their beds safe in the knowledge that the new flood defences are securely in place, but also believe that they are contributing to a new and more prosperous future for the riverside area in which the River Trent can again be an asset to the town.

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The town of Gainsborough lies within the district of West Lindsey in Lincolnshire, and is situated on the east bank of the lower tidal reach of the River Trent, some 43 kilometres above Trent Falls, the confluence with the River Humber. The low lying character of most of the town and the encroachment of buildings right up to the water's edge, makes Gainsborough particularly vulnerable to flooding when spring tides coincide with high river levels. The town has been subject to substantial flooding in the past and, prior to the improvement scheme, was protected by flood defences consisting of walls and buildings in various forms of construction and age.



Introduction

Before the mid 19th century, the prosperity of Gainsborough was based on river trade and agriculture. The town used to be a significant inland port with several wharves along the river frontage. In 1849, with the coming of the railway, the abandonment of these wharves began.

Over the last twenty-five years, Gainsborough has suffered from an acceleration of this decline and there are now no working wharves left along the east bank frontage of the town. The only working wharf in the area is Trent Wharfage Ltd on the west bank in the middle of Beckingham Marshes. The traditional engineering and river-based industries and the commercial traffic once prevalent along the Gainsborough waterfront have now gone leaving a significant and highly visible area of the town derelict, unsightly and neglected.



Key

motorways

railways

Flooding - the history



Top
Roper Road, 1947

Bottom
Morton Breach, 1947

The valley of the River Trent, from time to time, has suffered calamitous floods. One of the earliest recorded floods was in 1346 when "from mid-summer to Christmas, the rains fell almost without intermission". According to Stark in 1614, Gainsborough and district was flooded for 12 miles around the town. A. de la Pryme Diary records that in December 1617 "The Trent by the melt of snow, has broken its banks near Morton, hard by Gainsborough and has driven almost the whole town away, drowning several men, women and children."

1770 and 1795 produced the two worst floods of the eighteenth century. In 1770, the water ran over the lock gates at Torksey and spread as far as Lincoln. The turnpike road from Walkerith Ferry was impassable for 12 days, the river having breached its banks a little below Morton. In 1795, matters were even worse as the Trent burst through the Spalford bank flooding Lincoln, with the water continuing down the River Witham and into the Wash. Local records show that there were other major floods throughout the nineteenth century in 1809, 1812, 1822, and 1852.

Undoubtedly the worst flood of the twentieth century was in 1947 when on the evening of Friday 21 March a breach occurred in the bank just upstream of Newsuns Wharf. On the morning tide of Saturday 22 March, water was flowing over the full length of bank from Bowling Green Lane to Morton Corner, flooding 2,000 houses and other buildings and covering an area within the town boundary of some 460 acres. The following day the bank at Morton downstream of Gainsborough breached thereby bringing relief to the flood levels at Gainsborough. The water tore a gap 280 feet wide and left a hole in the land, which was 50 feet deep in places and 250 feet inland. It caused the flooding of 16,000 acres of valuable agricultural land on the eastern bank for a distance of nearly 20 miles. A 600-ton Dutch crane was brought across the North Sea to seal the Morton breach.

In 1954 there was a tidal surge on the river and in the lower reaches water poured over the banks for a considerable length.



Beckingham Marshes

Situated on the left bank of the River Trent opposite the town of Gainsborough are Beckingham Marshes. The marshes represent a large flood storage area that is an integral part of the flood defences of the area, providing substantial protection to Gainsborough. The marshes are bounded in the east by the River Trent, in the south and west by a railway embankment and in the north by Misterton floodwall. The marshes are protected from inundation by a floodbank that is generally 1.5 metres lower than the Gainsborough defences. Whenever the fluvial flow exceeds 850 m³/sec, river water starts to enter the

marshes immediately downstream of Gainsborough railway bridge. Since this part of the river is tidal, water can enter the marshes at lower flows if tidal conditions dictate. The marshes cover an area in excess of 1,000 hectares, and when full, contain approximately 23 million cubic metres of water.




The scheme

Background

As a consequence of the major floods in 1947, a flood relief scheme for Gainsborough was implemented in the early 1950s to give added protection to the town. This scheme provided a rigid flood defence along the river frontage of the town for a length of 2.4km (1½ miles).

Old warehouse walls were encased in concrete, and gaps between buildings 'plugged' by a concrete wall. However, this work was all built onto the existing structures, some of which were then already over 100 years old.

In the early 1960's, the standard of flood defences was reassessed as a consequence of the tidal surge floods in 1954. As a result, the defences were again raised and strengthened and covered with a concrete coating. These improvements were designed to cope with the conditions that would have arisen if the 1947 river flow had coincided with the 1954 tidal surge.

In 1982, the former Severn Trent Water Authority commissioned a structural survey of the defences. Following this, some remedial works were undertaken mainly consisting of general patching work to the cracks.

In 1990/91 the Agency's predecessor, the National Rivers Authority (NRA), commissioned an asset survey. This concluded that, having been in place for over forty years, and in most places being founded on original structures now over 100 years old, many of the walls and their foundations urgently needed to be replaced. In some instances, the existing structures were unlikely to last more than five years before collapsing. Approximately half of the buildings along the Gainsborough frontage

were derelict or had been demolished. Many of the remaining buildings were in very poor condition and could not be considered structurally sound.

The NRA developed a mathematical model to simulate upstream flows and downstream tides over the tidal length of the River Trent between Cromwell Lock (downstream of Newark) and Trent Falls. The mathematical model showed that should a breach occur in the defences, nearly 400 properties would be directly affected by flooding in a 1 in 200-year event. Floods are categorised by their size and the frequency with which they can be expected to occur. A 1 in 5 year flood is one that has a 20% chance of happening in any year - this is a relatively minor flood. A 1 in 200 year flood has only a 0.5% chance of happening in any year, but its effects can be enormous.

In addition to providing the appropriate standard of flood protection, three major considerations were identified early in the feasibility study. Firstly, adequate access was required to the full length of the new works to enable future maintenance to be carried out safely and economically. Secondly, new works should not rely on the existing walls and buildings for any part of their stability. Thirdly, the works should not prejudice future development of the already narrow sites between the river and Bridge Street, a major north-south route through the town, nor endanger existing buildings on those sites.

Approximately half of the buildings along the Gainsborough frontage were derelict or had been demolished.



Partnerships

At the same time as the flood defence feasibility study was being undertaken, West Lindsey District Council was formulating a Riverside Development Plan with the following objectives to:

- improve pedestrian links, access to the river and the image of the area.
- promote private investment into property through public expenditure, environmental works and image changes.
- encourage people to use, live near and to work on the waterfront.
- promote activity, vitality and a sense of civic pride.



There was an obvious and major overlap between the flood alleviation scheme and the council plan. Discussions were held with the council to explore the possibility of the proposed works being used as a catalyst for urban regeneration. These discussions culminated in a successful application for a Single Regeneration Budget (SRB) grant from the Department of the Environment, Transport and the Regions (DETR). The bid for the grant was made by a partnership known as Gainsborough Regeneration Partnership, including the following organisations:

- West Lindsey District Council
- Lincolnshire County Council
- Lincolnshire TEC
- East Midlands Development Agency
- Midland Bank (now HSBC)
- Local Businesses
- NRA (now Environment Agency)

The SRB grant was based on three topics:

1. The additional costs of upgrading the riverside access intended for the maintenance of flood defences to form a high quality public promenade.
2. Bringing forward works on those lengths of frontage where the anticipated remaining life did not justify reconstruction from a flood defence viewpoint but the resulting gap in the promenade would adversely affect the regeneration proposals.
3. Various projects connected with the regeneration of the sites behind the flood defence works.

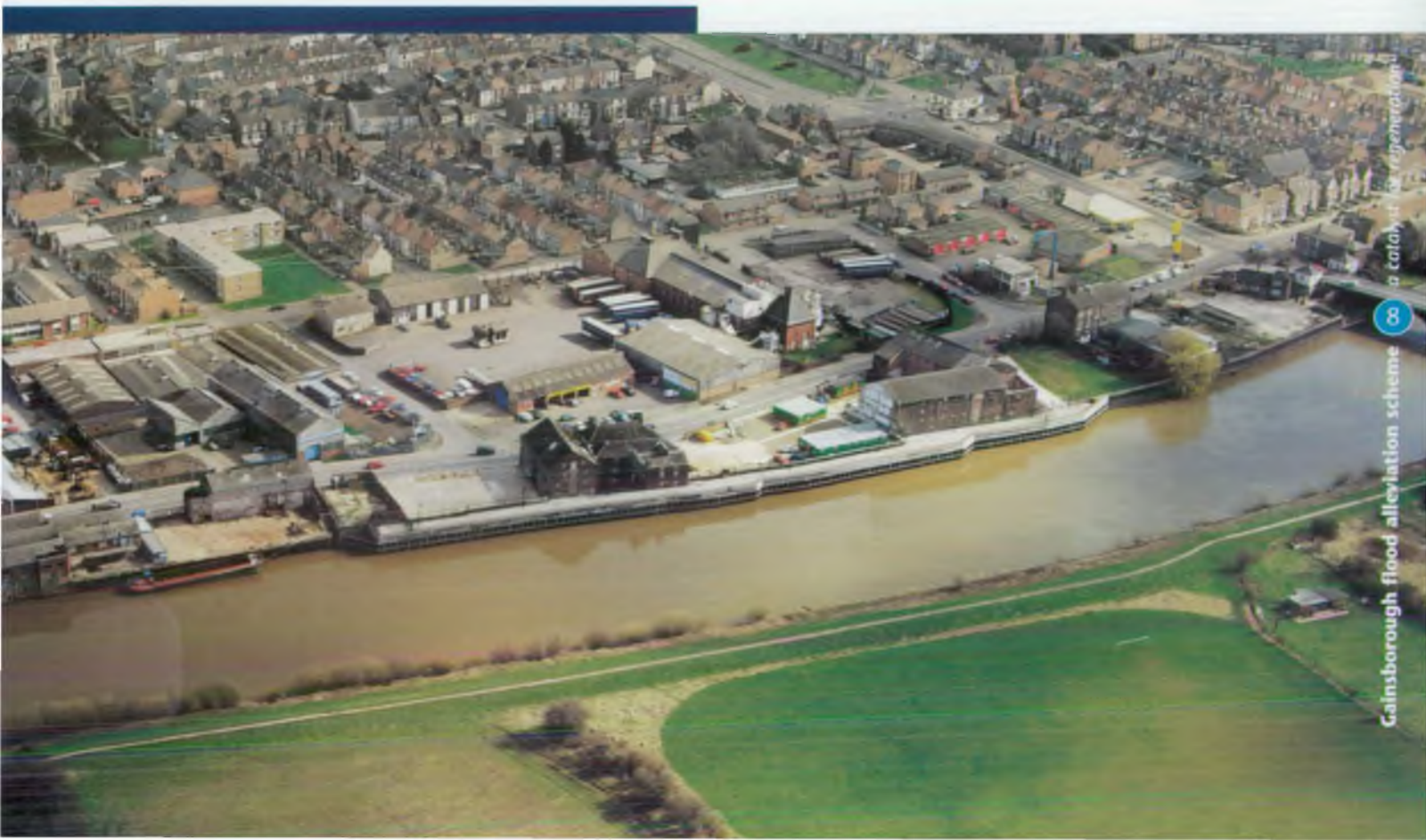


promote activity, vitality
and a sense of civic pride

Consultation

Extensive consultations were carried out with a wide range of organisations and groups including the following (in alphabetical order):

- Associated British Ports
- Bassetlaw District Council
- British Waterways
- Countryside Agency
- East Midlands Development Agency
- English Heritage
- English Nature
- Gainsborough Development Trust
- Gainsborough Regeneration
- Gainsborough Town Council
- Local Businesses
- Lincolnshire County Council
- Riparian Owners
- West Lindsey District Council



The scheme in detail

The simplest method of defence replacement was found to be a single sheet-piled wall immediately in front of the existing wall and tied back to adjacent ground. This method was only suitable at Whitton Gardens where the existing public open space allowed for ties to be installed and allowed maintenance access from a paved strip behind the wall and at Gleadell's wharf.

Elsewhere, where the existing river wall was in front of, or in places actually formed by, existing buildings, it was proposed to construct an independent structure by driving two rows of piles 5 metres apart in front of the old structures. The piles would then be tied together and the space filled between the piles and between the structure and the old wall. In this way the structure would be free-standing and the top available for future maintenance access. The effects on the river of reducing the width by 5-6 metres were assessed using the mathematical model and found to be insignificant.

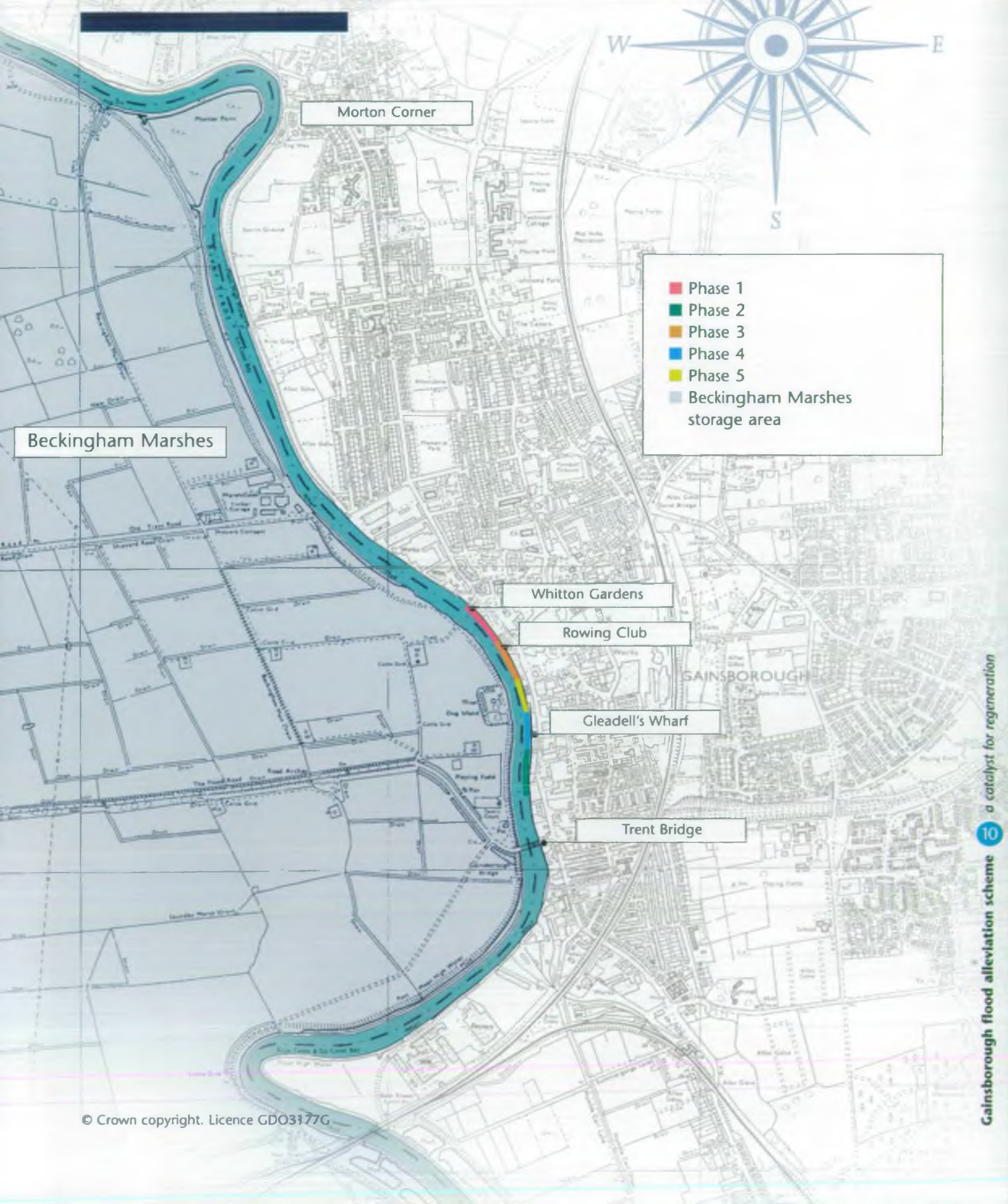
The overall scheme comprised approximately 800 metres of new flood defences in front of the existing defences, along the majority of the river frontage through Gainsborough. A further 2,000 metres of defences along this frontage was considered satisfactory for the fifty year life of the scheme. The latter being required in order to optimise the flood storage capacity of the marshes. The scheme is designed to protect approximately 400 properties from flooding from up to a 200-year flood event. The scheme was designed after extensive consultation with local people and organisations.

Prior to works commencing, unsafe riverside buildings were strengthened by using funding from Gainsborough Regeneration and the Environment Agency. The Agency's contribution towards this strengthening work offered a significant saving over the alternative of supporting the buildings during construction. Due to access restrictions, much of the river works were constructed by first installing a temporary jetty in the River Trent parallel to the proposed works and then using this jetty as a platform from which to build the adjacent permanent works. Navigation arrangements were agreed with Associated British Ports and the Department of the Environment, Transport and the Regions, to ensure the safety of river users during construction. The use of vibrationless piling techniques was adopted due to the closeness and condition of the adjacent buildings.



Gainsborough

flood alleviation scheme



The construction of the works was undertaken in several phases:

Phase 1

The first phase of the scheme consisted of the construction of 180 metres of single sheet-piled wall in front of Whitton Gardens, together with a 15 metre length of double sheet-piled wall in front of Gainsborough Rowing Club. The construction allowed a riverside walkway to be developed along its surface. Whitton Gardens has since been re-landscaped, having been partially demolished to allow the installation of anchors for support of the new wall. It now provides an attractive riverside front. New benches and seating have been installed to give residents and visitors the chance to view the River Trent.



Above
Whitton Gardens

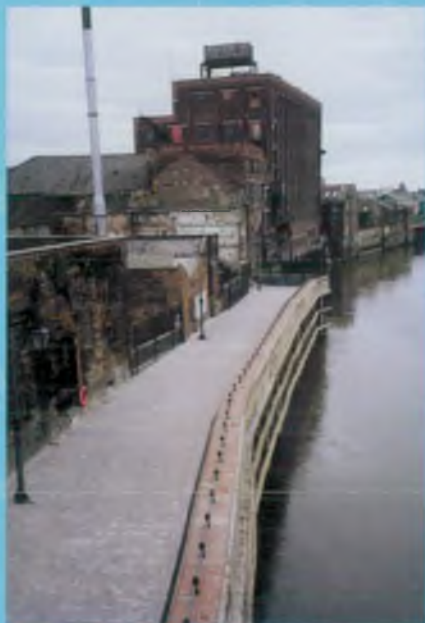
Phase 2

Phase 2 involved the construction of 200 metres of new flood defence approximately 6 metres wide in front of disused wharfage and warehousing near Trent Bridge. The new defence is a free-standing structure founded into the riverbed. The structure stands approximately 7 metres above the riverbed and has been filled with concrete and topped with an access walkway and parapet wall.



■ Phase 3

The third phase saw the construction of 185 metres of free standing wall, 6 metres wide, in front of private properties and commercial undertakings between the Rowing Club and Whittons Mill.



■ Phases 4 & 5

The fourth and fifth phases consisted of the construction of 220 metres of new wall, approximately 6 metres wide. At the area known as Gleadell's Wharf a 'lay-by' was created to allow potential development for a leisure boat mooring area in the future. Timber fenders have been fixed to the riverward face to provide protection from river craft. The whole length has been topped with block paving to provide pedestrian and vehicular access.

Gleadell's Wharf under construction



For part of Phase 3 and Phase 5, funds were provided by Gainsborough Regeneration to construct works earlier than required by flood defence needs. On all phases, additional funds were provided to upgrade the landscaping of the promenade. The installation of street furniture, street lighting, benches and litter bins have provided the people of Gainsborough with an attractive walkway along the frontage of the River Trent together with flood defence protection.



Design considerations

The design theme used throughout all phases of the scheme was to maintain the original character of the frontage as a Victorian wharf. Wooden fenders protecting the original wharf were replaced by oak timber fenders, from a renewable source, along the new wall. Not only does this maintain a shipping theme, but it also breaks up the visual monotony of a sheet pile wall of this length. An added benefit of this design is that birds will find roosting and nesting pitches within the framework of the fenders and invertebrates will thrive in this new habitat, both above and below the water line.

A strong design theme is the use of iron railings and lighting echoing the Victorian style, but in a modern rendition, using clean lines and simple form. Landscaping to a high standard, and provision for future works such as CCTV, was included as part of the enhancement funded by the Single Regeneration Budget. As a consequence, the emphasis of the scheme at Gainsborough is the conservation of an historical working environment for people to use and enjoy.



Design competition for schools

In October 1997, the Environment Agency, with support from Gainsborough Regeneration, launched a competition for local schools to design artistic centrepieces for the flood defence scheme. Teams from more than twenty schools had to produce artistic creations which evoked the river in some way. The primary school entrants had to come up with a mosaic design, while the secondary schools had to design a sculpture of some kind.

The winning entries were announced at a public exhibition on 13 May 1998. Handel House School won the mosaic competition, while the best sculpture was produced by Queen Elizabeth's High School. The successful designs have provided direct inspiration for the new landscaped public amenity area at Corporation Yard and for the series of public art works created throughout the 'Riverside Area'.



Boats calling at Gainsborough used cobbles as ballast, which was unloaded when they took on grain.

The anchor, a heavy weight, traditionally used to hold the boat in place, shows how Gainsborough has been embedded in the past.

But the anchor is now being pulled out of the cobbles, signifying how the history of the Trent is helping Gainsborough to pull itself into the future.

Natacha Withoft

Funding

The Gainsborough Flood Alleviation Scheme was approved and financed by the Severn-Trent Regional Flood Defence Committee. In addition to the funding from the Single Regeneration Budget through Gainsborough Regeneration, contributions were made by the Ministry of Agriculture, Fisheries and Food in the form of Grant Aid.

Maintenance

Regular river maintenance and monitoring of the flood defences are essential to ensure that all of the benefits of the improvement works are achieved. Environment Agency staff are available around the clock to ensure that defences work properly. At Gainsborough, Agency staff routinely check the defences and undertake any remedial work that is necessary. This work has been made much easier as a result of the improved access arrangements afforded by the scheme.

The scheme in operation

In November 2000, just two weeks after the scheme was completed, the highest river levels for 45 years were experienced at Gainsborough. The new defences passed their first test without any problems and prevented serious flooding in the town. During this flood event, Beckingham Marshes were also fully operational acting as a flood storage area.

WATER, WATER EVERYWHERE!

Town is saved by £20m flood defence

Gainsborough Market Place would have been under water if it were not for the town's new £20million flood defences.

The defences, finished only two weeks ago, protected Gainsborough from river levels not seen since the great flood of 1947...

A debt of gratitude is owed...

The River Trent flood defences which held and held well at the first call.

... The flood defences in our town which kept us all dry and safe from harm and damage are a shining example to others of what can be achieved if you spend fortunes wisely...

Football matches on the Trentport playing 11
the flooding.

Key facts

Number of properties protected from a 200-year flood event:	400
Length of hard defences:	800 metres
Total cost of scheme:	£16 million
Benefit cost ratio:	5:1
Scheme commenced:	February 1996
Scheme completed:	November 2000
Length of River Trent:	286 kilometres
River Trent catchment area:	10,435 km ²



PHASE	WORK COMMENCED	WORK COMPLETED	DESIGN CONSULTANTS	MAIN CONTRACTOR	APPROX COST
1	February 1996	August 1996	Mott MacDonald	Clugston Construction	£1.6 million
2	October 1996	December 1997	Halcrow UK	Edmund Nuttall Ltd	£5.5 million
3	September 1998	July 1999	Halcrow UK	Edmund Nuttall Ltd	£4.5 million
4/5	November 1999	November 2000	Posford Duvivier	Edmund Nuttall Ltd	£4.4 million

Consultants and contractors

During the design and construction of the scheme, the following consultants and main contractors were engaged (in alphabetical order):

- Clugston Construction
- Edmund Nuttall Ltd.
- Halcrow UK
- Mott MacDonald
- Posford Duvivier



a catalyst for regeneration

Gainsborough flood alleviation scheme 17 a catalyst for regeneration



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UPPER TRENT

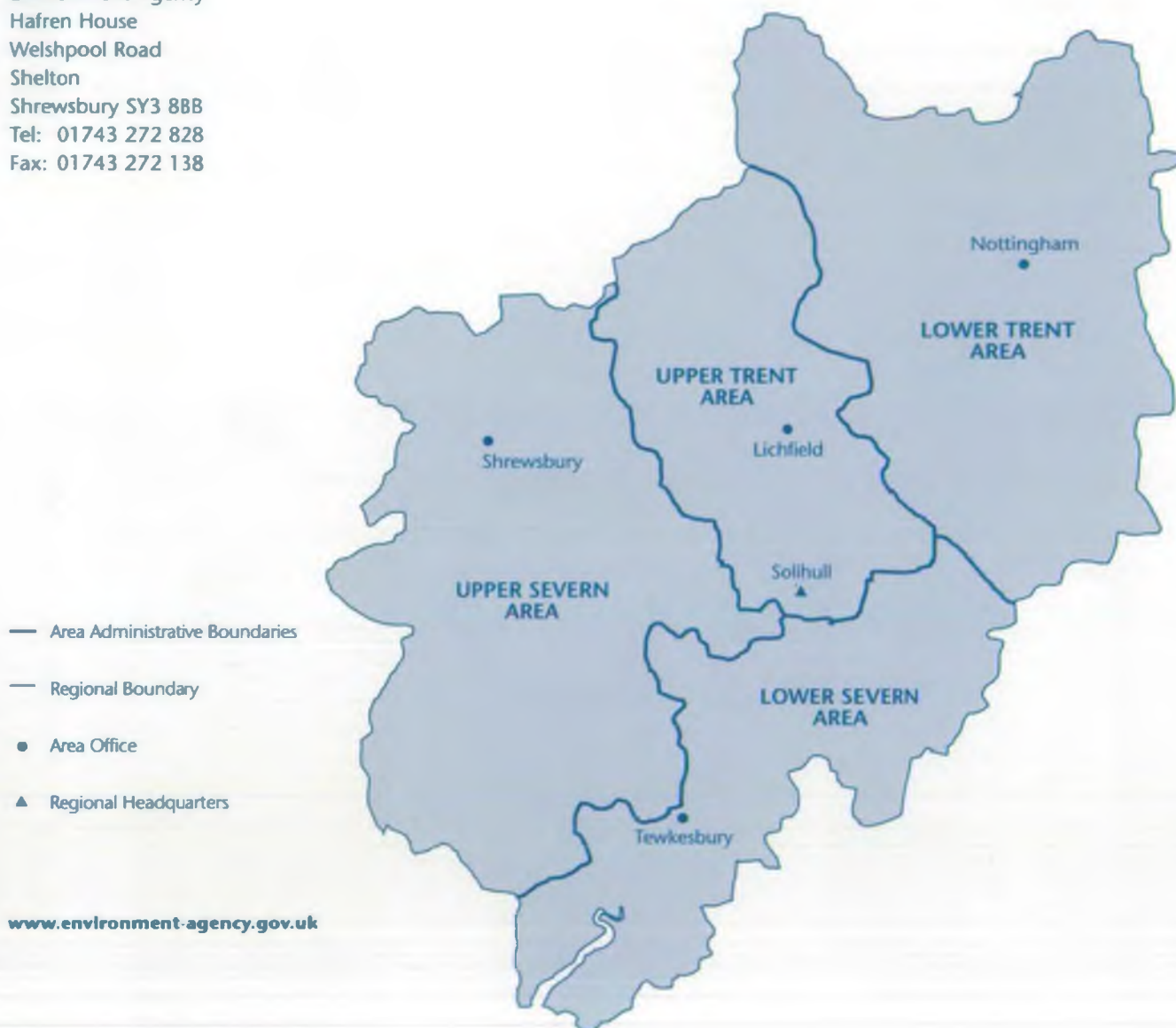
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